

NOS BiH
НОС БиХ

Nezavisni operator sistema u Bosni i Hercegovini
Независни оператор система у Босни и Херцеговини

Neovisni operator sustava u Bosni i Hercegovini

Independent System Operator in Bosnia and Herzegovina

GRID CODE

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2. Introduction

“Law on Transmission of Electric Power, Regulator and System Operator in Bosnia and Herzegovina” (Official Gazette BiH No. 7/02 and 13/03 hereinafter called Law on Transmission of Electric Power), “Law on Establishment of Independent System Operator for Transmission System in Bosnia and Herzegovina” (Official Gazette BiH No. 35/04 hereinafter called Law on ISO) and “Law on Establishment of Company for Transmission of Electric Power in Bosnia and Herzegovina” (Official Gazette BiH No. 35/04 hereinafter called Law on Transmission Company) define the roles and responsibilities of the State Electricity Regulation Commission (referred to as SERC), Independent System Operator (referred to as ISO) and Transmission Company.

- a) This Grid Code for Transmission System BiH was developed in accordance with above mentioned Laws, by the Independent System Operator in Bosnia and Herzegovina (ISO) in accordance with its obligations mentioned in the above paragraph.
- b) The objective of the Grid Code is to define the elements for safe and reliable operations of the electric power system of Bosnia and Herzegovina in compliance with the defined quality standards, providing the connection to the electric power system of current and potential users in an objective, non-discriminatory and equal way.
- c) As set forth in the law, ISO will provide for the development and publication of technical rules, which will enable minimum technical and operational requirements for the connection into a single electric power system of directly connected generation units, directly connected consumers to the transmission network and distribution systems within BiH.
- d) These rules form a basis of the Grid Code to include operational procedures and the principles of the relations of the ISO with the Transmission Company and the users of the transmission system of BiH, both under normal and disrupted working conditions of the electric power system (*EES*).
- e) The Grid Code has been designed to enable development, maintenance, and management of the transmission system in accordance with the UCTE rules and good European practices in this field.
- f) The Grid Code is linked to and is complementary to the Market Rules and an appropriate tariff methodology, which relate to the connection and exploitation of the BiH transmission system.
- g) As referred to in the foregoing laws, ISO has an exclusive responsibility and authority to perform the following activities:
 - Management of the operations of the transmission system in Bosnia and Herzegovina of the 400, 220 and 110 kV voltage levels by direct orders to the operational staff of a substation or switchgear, i.e. direct remote control. Through special agreement ISO may transfer functions of management to individual elements of transmission grid to the Transmission Company;
 - Management of the remote control and management equipment, which is necessary to manage the operations of the transmission system in real time;
 - Management of the equipment for the remote meter reading, which is necessary for the management of the balance market and settlement;

- Issuance of orders to the balance responsible parties in order to implement the planned exchange program and eliminate balance errors;
 - Adjustment and approval of the planned disconnections of the elements of the transmission network and generation facilities;
 - Approval and control of transit through the transmission network respecting technical constraints;
 - Communication and coordination of all activities with operators of neighboring systems, UCTE control block and UCTE
 - Review, approval, direct revision and publication of a long-term transmission network development plan;
 - Drafting i.e. determination of the Indicative Generation Development Plan.
- h) Each activity directly related to transformers 110/x kV and middle voltage equipment related to planning and management is within the jurisdiction of Transmission Company, Distributor and Transmission grid user.
- i) Transmission Company shall conduct its transmission activities related to transmission in full accordance with technical standards of ISO, operational planning, instructions for dispatching, maintenance schedules, grid expansion plans as well as provisions of SERC where that is applicable.
- j) ISO and the Transmission Company will cooperate and coordinate all the issues which relate to the implementation of the foregoing laws and this Grid Code as well as other issues related to efficient operations, maintenance, development and expansion of the transmission system, in accordance with the decisions of SERC, when appropriate.
- k) In accordance with the obligations set forth in the foregoing laws, ISO will cooperate with relevant stakeholders and modify this Grid Code.

3. Glossary and Definitions

3.1 Acronyms and Abbreviations

In the Grid Code, the following acronyms and abbreviations will have the following meanings:

AAC	Already Allocated Capacity
AC	Alternating Current
ACE	Area Control Error
AGC	Automatic Generation Control
APU	Automatic Re-Connection
ATC	Available Transfer Capacity
BiH	State of Bosnia and Herzegovina
BOS	Balance responsible parties
CET	Central European Time
CT	Current Transformer
DC	Direct Current
SERC	State Electricity Regulation Commission
EMS	Energy Management System
ETSO	European Transmission System Operators Association
HV	High Voltage
IC	Identification Code (of the metering point)
IEC	International Electro-Technical Commission
IGDP	Indicative Generation Development Plan
MV	Medium Voltage
ISO	Independent System Operator
NTC	Net Transfer Capacity
PPPD	Planning Parameters for Generation and Dispatching
SETSO	Southeastern European Transmission System Operators Association
SVC	Static var compensator
TRM	Transmission Reliability Margin
TTC	Total transmission capacity
UCTE	Union for Coordination of Transmission of Electric Power
VT	Voltage transformer
SCADA / EMS	Supervisory Control and Data Acquisition/Energy management system

TPP

Thermal Power Plant

3.2 Definitions

The following words and expressions in the Grid Code will, unless otherwise required by the context, have the following meaning:

Term	Meaning
Active energy	Measure of generation or consumption of active power of device integral in one particular time period. Expressed in kilowatt-hours(kWh), megawatt-hours (MWh) or gig watt-hours (GWh).
Active power	Real component of apparent power, usually expressed in kilowatt-hours (kW) or megawatts (MW).
Automated generation control (AGC)	Equipment which automatically adjusts generation to maintain requested level of generation i.e. exchange program plus its participation in frequency regulation. It is a combination of secondary regulation of regulation area and function of dispatching of generation in real time. Secondary regulation is conducted by system operator, and generation planning by appropriate generation companies.
Automated reconnection of TL (APU)	Short-term outage for 1000 to 1200 ms, single-pole or three-pole, disconnection of one (in case of a unilateral feed of the defect point) or more circuit breakers (in case of a multilateral feed of the defect point). <u>Successful APU:</u> if error occurs during deenergization. <u>Unsuccessful APU:</u> if error remains and causes definitive disconnection by protection.
Automated unloading	Partial disconnection of consumption which is achieved by the effect of sub-frequency relays.
Balance responsibility	Responsibility of each licensed party toward ISO, to have its sum of generation and purchase be permanent balance with consumption and sale.
Balance responsible party	Licensed party which undertook balance responsibility and which registered with ISO as a balance responsible party. There is a precisely set number of points of receiving and/or delivery of electric power. The Daily schedule is indicated for the balance responsible party. In accordance to the Market Rules, during Phase I, BRPs may be only Elektroprivredas in the BIH.
Balance market	Centralized market administered by the ISO with a goal to maintain balance of EES BIH.
Database of readings	Database which contains the readings.

Black start	Ability to start a generation unit without an outside supply source of own consumption. The procedure initiated by ISO or the unit upon the authority of ISO, for return to normal state after complete or partial breakdown of the electric power system. It falls under ancillary (system) services.
Imbalance BRP	Difference between the program and the exchange realized by the BRP in reviewed time horizon.
Defined metering point	Physical location in which the total requirements of precision as indicated in the Metering Code must be met. The locations of these metering points are fully defined in the relevant connection contracts.
Directly connected consumer	Consumer whose connection points are on HV transmission grid.
Dispatcher	Operational staff authorized for issuance of dispatching orders/instructions.
Dispatching instruction	Dispatching instruction of ISO operational staff issued to operational staff in the management centers for generation, distribution and operators of neighboring systems with an objective of coordination and harmonization of activities on increase of facility security, improvement of the regime which systems may put to the condition of decreased security and violations of exploitation parameters. Instruction/order for managing the electric power system issued by ISO, which relates to the operations of generation units, transmission network and user systems, including the use of ancillary services.
Dispatching Order	Executive request form operational staff of ISO to operational staff of Transmission Company, as well as operational staff in the generation management centers, and which are related to implementation of manipulations of commutation apparatuses in the facilities of transmission grid, usage of resources of ancillary services in accordance to valid agreements, securing of secure and stable functioning of EES facilities, as well as implementation of procedures in the phase of restoration of EES.

Dispatching	Process of managing the electric power system, which includes short-term planning of generation and consumption,(with an objective to balance the system) managing the electric power system in real time and the use of ancillary services which provide for stable and safe operations of the electric power system.
Distributor	Subject responsible for expansion, development, maintenance, operation and managing middle voltage and low voltage of the grid.
Distribution Grid	Electric grid which spreads from the point of division with activity for transmission of electric power or power plants to end users on middle and low voltage.
Daily Schedule	Document through which program of generation, exchange and consumption of electric energy (including energy for coverage of transmission losses) and power of Balance Responsible Party, System Users and Licensed parties is defined and delivered to ISO.
Annual Overhaul Plan	Plan of disconnection of elements of electro-energy system due to overhauls approved by the ISO.
State holiday	All the days which the state of Bosnia and Herzegovina proclaimed state holidays.
Long-term outages due to maintenance	Planned disconnection of the elements of the electric power system as indicated in the annual plan of maintenance and approved by ISO.
Interconnection	Line or transformer by which the electric power system of BiH was connected to the electric power system of a neighboring country.
Power plant	Plant which converts primary forms of energy into electric power, i.e. generation of electric power. It may consists of more generation units.
Power plant with a possibility of black start	Power plant registered with ISO as a plant which has at least one generation unit with a possibility of black start.
Power factor	Ratio of active power and apparent power.
Ground junction factor	In a given point of the system, the ratio between the effective value of voltage of a healthy phase toward the ground before the defect and the effective value of voltage of the affected phase. This ratio must always be more than 1 and is a function of the ratio of the direct and zero reactance.
Frequency	Number of cycles of alternating current in a second, expressed in Hertz (Hz).
Flicker	Disorder of human sight caused by changing the level of light of the light source. This occurs as a consequence of the change of level and frequency of the envelope of the supply voltage of the light source.
Main meter	Metering instrument which measures the flows of active and reactive power at the metering point (point of receiving and delivery) in the transmission network.

Area control error (ACE)	Error of the control area is a current difference between the planned and actual exchange of power of the concrete control area.
Identification code of the metering point (IC)	Single alphanumerical code for each metering point.
IEC standard	Standard approved by the International Electric Commission
Indicative Generation Development Plan	Plan which takes into consideration planned generation capacities defines the needs for generation facilities for the next ten (10) years.
Instructions on emergencies (breakdowns)	Instruction issued by ISO to the Transmission Company or users for maintaining safety of the transmission system in the affected facility and may require activities outside the planning parameters.
Interconnection	Line i.e. transformer through which electro-energy system of BIH is connected to electro-energy system of neighboring country.
Disconnection	Accidental transition of a network or generation element from the operational to non-operational state.
Export	Power and energy delivered outside the system of Bosnia and Herzegovina.
Characteristic of regulation of frequency and power	Characteristic that defines the way of calculation of a regulation error of the secondary regulation of active power and frequency of the regulation area or electric power system, which the secondary regulation brings down to zero.
Communication link	Communication equipment and communication arrangements between the local instrument/instruments for data storage and public or private telecommunication networks.
Control / Regulation area	Part of the interconnected UCTE system (usually coincides with the territory of a company or state, physically delineated by the position of the metering points for the power exchanged with the remaining interconnected system), administered by the Independent System Operator, with real flows and controlled generation units connected within the control block. The control area may be part of the control block which has its own sub-control in the hierarchy of the secondary regulation of frequency.
Control/Regulation block	One or more control areas which cooperate in matters of regulation of frequency and power of exchange with UCTE.
Control center ISO	Location from which a control transmission system is managed in regulation area.
Block coordinator	Block coordinator is a system operator which is responsible for the secondary regulation of the entire block toward the interconnected neighbors.

User system	Every system owned by users and managed by the users, which consists of generation units, networks, as well as equipment and instruments for the connection of generation units and users directly connected to the network.
Transmission System user	Every physical or legal entity which delivers and/or receives electric power in the transmission network.
Safety requirement (n-1)	Requirement which ensures that a single disconnection of any element of the transmission network (line, interconnected line, network transformer, generation unit) in the control area does not jeopardize normal operations. It does not relate to disconnections of bus bars or disconnections with joint cause.
Eligible customer	Customers who are entitled to select their suppliers in accordance with the rules of regulatory commissions.
Licensed party	Entity which holds a license in accordance with the rules of regulatory commissions.
Maximum power	Maximum power exiting generation unit in MW and MVar, under normal working conditions, in compliance with the Grid Code.
Transmission reliability margin	<p>Margin of a safe transmission which is introduced in order to have a necessary safe margin for regulation (e.g. secondary regulation of frequency and power of exchange) having acknowledged the lack of safety with respect to the condition of the <i>EES</i> and scenario and to the precision of data and applied IT (Information Technology) methods and models.</p> <p>Possibility of transmission is indicated together for all interconnected (connecting) lines between two adjacent interconnected control areas within a given timeframe, for both directions of transmission.</p>
Measures in unforeseen circumstances	Measures which are undertaken in the conditions of disrupted operation and which are defined in the Code of Measured in Unexpected Situations
Metering transformer	General name for current transformers (CT) and voltage transformers (VT).
Dead zone of the regulator	Deliberately set value at the turbine regulator inside of which there is no resulting change in the position of regulating valves in the regulatory system of speed/load.
Blueprints of the location	Blueprints prepared for each connection location in accordance with the Terms for Connection.
Voltage transformer	Transformer which is used with meters and/or protective instruments in which voltage in the secondary winding within the prescribed error margin is proportionate to the voltage and phase in the primary winding.

Unintentional deviations	Difference between the exchange defined in the exchange program and the exchange realized.
Unplanned outage	Outage which the Transmission Company or the user must organize due to inevitable circumstances, which was not planned.
Non-working days	All Saturdays, Sundays and holidays
Net transmission capacity	Represents best assessed margin of the possible transfer of power exchanged between two regulation areas accorded with safety standards and taking into consideration technical uncertainty of future conditions on the grid.
Independent System Operator	Company established in accordance with the ISO Law.
Published network constraint	Constraint of the system established and published by ISO one (1) day before submitting the Daily Schedule.
Approved Daily Schedule	Exchange program submitted to ISO and approved by ISO, which is applicable for a given day and is binding for the balance responsible party which submitted it.
Maintenance of frequency	System service to maintain the system frequency with a declared precision.
Maintenance of voltage	System service to maintain the voltage within declared margins.
Load	Power which the consumption instruments and the user receives from the transmission system. Load is not to be identified with consumption.
Island	Part of the electric power system which is galvanically separated from the main <i>EES</i> .
Plan of rehabilitation of the electric power system	Plan which is drafted and maintained by ISO for the periods during which the overall electric power system of BiH or its parts has been disconnected from the UCTE system, which will indicate the overall strategy of rehabilitation of the electric power system.
Plan of protection	Plan which contains all technical and organizational measures for the prevention of expansion or deterioration of incidents in the <i>EES</i> .
Planned outage	Planned disconnection of a generation unit, transmission element or part of the user system, coordinated by ISO.
Capability chart of generation unit	Capability chart, which indicates the limits of operational capabilities of a generation unit in MW and MVar under normal circumstances, as defined in the Terms of Connection.
Disruption	Unexpected outage or disconnection of system elements (generator unit, transmission line, circuit breaker or other elements).

Disrupted supply	Disrupted supply is marked by the state: -all customers are still supplied -marginal values of voltage and frequency are not maintained anymore -possible overload of generation and network units -(n-1)-requirement does not hold anymore.
Ancillary service	All services provided to the system users, except generation and transmission of electric power, provided by ISO for the purpose of providing system services.
Auxiliary meter	Meter, except the main meter, which is used as an additional source of readings.
Auxiliary power supply	Independent source of electric power which can start a generation unit without an outside supply source.
Pumping consumption	Consumption of a pumped-storage hydropower plant for pumping water from the storage basin at the lower level to the storage basin at the higher level.
UCTE rules and standards	Rules and standards set forth in the UCTE Operations Manual and all other rules, standards and recommendations as approved and published by UCTE.
Idle motion	Idle motion of a generation unit is a condition in which a generation unit is disconnected from the electric power system and loadless, at nominal speed and excited generator.
Transient stability	Ability of the electric power system to maintain synchronism after major disruption (in terms of type, location and duration of that disruption). The system is unstable if only one of its generation units loses synchronism in case of such disruption.
Transmission Company	Company established in accordance with the Law on Transmission Company.
Transmission system	Elements of the electric power system used in the transmission of electric power and energy.
Request for connection	Request submitted by the user seeking the connection to the transmission system.
Primary regulation of frequency	Maintains balance between generation and consumption in the network, using the regulator of the rotary speed of the turbine. It is an automated decentralized function of the turbine regulator which adjusts the generator's output as a response to the frequency change in a synchronized zone.
Apparent Power	Product of voltage (in volts) and power (in amperes). Consists of real component (active power) and imaginary component (re-active power) often expressed in kilovolt-amperes (kVA) or megavolt – amperes (MVA)

Electric power generator	Entity with a license to generate electric power.
Generation unit	Equipment through which primary energy is converted to electric energy.
Metering provider	The one who provides metering services, such as metering installation, calibration and maintenance for market users.
Available transmission capacity (ATC)	The amount of net transmission capacity (NTC) which is still available for commercial transactions, i.e. positive difference between NTC and the already assigned capacity (AAC).
Unloading	Reduction of load in a controlled way by disconnecting the users.
Reactive energy	Measure of generation or consumption of re-active power Integral of the reactive power in particular time period. Expressed in kilovar-hours (kVARh), megavar-hours (MVARh) or gigavar-hours (GVARh)
Reactive power	Re-active power is imaginary component of apparent power. Often it is expressed in kilovars (kVAR) or megavars (MVAR) Re-active power is that part of electric energy which creates and maintains electrical and magnetic fields of equipment of inter-changeable energy.
Register of balance responsible parties	Register which contains the information on all registered balance responsible parties, maintained by ISO and open to the public.
Metering register	Register of the information related to the metering installation. This register includes the data on the type and technical specifications of equipment, revision and calibration, specific data on the location, etc.
Regulation of frequency	Measures taken to bring the system frequency within the set parameters on interconnection points on the grid.
Regulation of voltage	Measures taken to maintain the system voltage within a given range in different nodal points in the network.
System disruption risk	Knowledge of the risk for major and serious disruption of the total or a part of the transmission system, based on which ISO issues warning to those users who might be in danger.
Secondary regulation	Centralized automated function which regulates generation in the control area in order to maintain the control of exchange of electric power through interconnected transmission lines within the set constraints and bring the system frequency back to the set values in case of deviation.
Secondary reserve	Positive and negative part of the range of the secondary regulation between the working point and the maximum and minimum values.

Metering system	All the components and instruments installed and which exist between the two metering points and the database of readings. This also includes the metering installation, all supporting communication links, hardware and software necessary for the function of compiling the readings, as well as all the data processing equipment.
Supplier	Entity which holds a license to supply electric power to customers.
Central European Time	Official time in Bosnia and Herzegovina.
Static stability	Ability of the system to maintain previous or similar stationary condition after small disruption.
Statism	Amount of relative quasi-stationary frequency deviance on the grid and relative change of output power from the generator caused by the action of primary regulator. This relation without dimension is often expressed in percentages.
Current transformer	Transformer used with metering and/or protective instruments in which current in the secondary winding within the prescribed error margin is proportionate and in phase with the current in the primary winding.
Connection point (network junction point)	Agreed connection points established between the transmission system or user system, as the case may be, and the system user.
Metering point	Physical point where electric power is metered.
Technical minimum	Minimum power in MW during which generation unit can permanently operate with prime fuel with stability maintenance process of burning in the fire-box of boiler in thermal units, i.e. within technically defined change in net drop within hydro units (according to topographic diagram of the turbine).
Tertiary Reserve	Power which may be activated (automatically or) manually with a goal of reestablishment of adequate reserve of secondary regulation, known as tertiary reserve or minute reserve.
Availability test	Test of availability of a generation unit, which is carried out in accordance with the requirements of relevant provisions and related contracts.
Total system breakdown	Situation in which all generation has been terminated and there is no supply of electric power from external interconnections.
Trader	Every licensed entity which trades with electric power.
Contract on Connection	Contract between the user and the Transmission Company entered into in accordance with the Terms of Connection of this Grid Code.
Contract on Ancillary and System Services	Contract between ISO and the provider of ancillary services.

Total transmission capacity	Total amount of power exchangeable between the parts of the interconnection without jeopardizing the safety of the <i>EES</i> and the interconnections.
Warning about system constraints	Warning issued by ISO that the system operates under aggravated conditions which may cause the constraint.
Consumption management	Controlled consumption cut.
Already assigned capacity	Total amount of awarded transmission rights, whether they are capacities or programs of exchange depending on the methodology for awarding.

4. Transmission System Planning and Development Code

- 4.1.1. ISO and TRANSCO are responsible, among other things, for planning and development of the transmission network and interconnection lines of 400 kV, 220 kV and 110 kV voltage levels in consideration of elements of energy policy BIH. ISO conducts "review, approval, direct revision and publication of long term development plan which is submitted by Transmission Company." Plans for expansion of the system are submitted to SERC for approval.
- 4.1.2. When planning the development of the transmission network, following requirements must be met:
- Transmission network must be planned to have dimensions which will allow for contracted and/or planned transmissions of electric power, reliable management of the electric power system as well as cost efficient supply under voltage and frequency, the quality of which is in line with the European standards and UCTE rules (Policy 3).
 - Plan of the transmission network development must be based on economic criteria in respect of the current loads of the transmission network elements and the generation of power plants, as well as future demand of the distribution and the transmission network users, to also include generation facilities which are already connected or will be connected to the transmission network, in the considered planned period (Indicative Generation Plan).
 - Transmission network must have dimensions which are in accordance with the safety requirement (n-1). The consequences of multi disruptions occurring in the transmission network are not taken into account when planning the development of the transmission network and must be limited by appropriate strategies of protection from major disruptions as well as policies of reenergization (re-established supply).
 - Transmission network must be planned to allow maintenance of static and transient stability as well as appropriate voltage profiles. To that end, the system operator may request from the generation company to harmonize the characteristics and parameters of the system for regulation of voltage and power of generation units which are important safety wise.
 - TRANSCO is responsible for initiation of the procedure of obtaining consents or licenses needed to implement the planned development of the transmission network.

- Transmission System Planning and Development Code, among other things, will define the requirements for information which system users are obliged to provide if they want to be connected to the transmission system. This is necessary for ISO and TRANSCO to be able to plan the development of the transmission system on the bases of the defined requirements.

4.1.3. Transmission System Planning and Development Code is applied to ISO, Transmission Company and the Users who under this code are considered:

- (a) Generators of electric power
- (b) Distributors
- (c) Directly connected Consumers

4.2 Procedures

- 4.2.1. TRANSCO should provide ISO with complete technical data on all the elements of the transmission network, which are necessary for safe management of the system. TRANSCO should inform ISO in writing about all the changes of the technical data or facilities.
- 4.2.2. ISO will make available to the TRANSCO data related to operation of transmission system necessary for development planning of transmission network.
- 4.2.3. ISO will each year publish the "Transmission System Development Plan" for the next 10 years by year, with an emphasis on structural modifications in order to help the users and prospective users in assessing the possibility of connection and exploitation of the transmission system.
- 4.2.4. Submitted planning data must be provided by the users when they submit requests for new or modified agreements on connection to the transmission system, or for each significant modification on their network or operating mode.
- 4.2.5. When there is no change in the data for several years, instead of submitting the same data again, the user may send a written statement saying that there was not change of the data from the previous period.
- 4.2.6. In coordination with ISO, TRANSCO will prepare the plan using the data which the users submitted to ISO. A proposal of the plan will be submitted to ISO once a year by end of July.
- 4.2.7. TRANSCO must submit the transmission system development plan to ISO for a review, approval, direct revision and publication. When ISO legitimately finds that it is necessary to make certain changes, it may request from the TRANSCO to change certain elements of transmission system development plan.
- 4.2.8. ISO will inform TRANSCO about every physical change of the submitted data by the User, which may require additional evaluation before its inclusion into the transmission system development plan.

- 4.2.9. Transmission system development plan with the current and planned data, contains:
- a) Review of transmission lines and cables with technical data;
 - b) Maximum and minimum power of generation units, including planned overhauls;
 - c) Maximum and minimum active and reactive power of consumer junction points and time needed to reach them;
 - d) Assessment of the load of the transmission network elements on the basis of the assessment of a simultaneous maximum and minimum load of the transmission network users using the safety requirement (n-1);
 - e) Transmission network losses;
 - f) Calculation of short circuit currents for each network junction point;
 - g) Assessment of static and transient stability;
 - h) Need to boost the system and/or change the topological structure of the transmission network;
 - i) Transmission capacity which can be made available to third parties;
 - j) Statistics on breakdowns and time of delays due to breakdowns and maintenance of high voltage lines and grid transformers in past five (5) years;
 - k) Required upgrading and replacement of the transmission network elements and equipment. (reconstruction, replacement of primary and secondary equipment, expansion of capacities of sub-stations, etc.)
 - l) Assessment of necessary investments for implementation of proposed plans
- 4.2.10 Prior to delivering to SERC for approval, ISO will organize direct revision of the Development Plan of Transmission system. Expert council for revision of the Development Transmission Plan which is formed by ISO will consist of representatives of ISO, Transmission Company and Transmission System Users.

4.3. Indicative Generation Development Plan

- 4.3.1 The objective of the Indicative Generation Development Plan is to inform the users (current and prospective) about the needs and projects of construction of new generation capacities.
- 4.3.2. The generation planning process will take into account the following:
- a) Required generation capacities to cover peak load;
 - b) Power balances in the transmission network;
 - c) Reserves of power and energy and possible deficits;
 - d) Harmonization with the transmission system development plan;
 - e) Meeting its power needs from own sources as a basic criterion for development of the Indicative Generation Development Plan.

4.4. Contents of the Indicative Generation Development Plan

- 4.4.1 The Indicative Generation Development Plan covers the period of ten (10) years. The plan defines requirements under which expected consumption in the period of next 10 years may be fulfilled with available generation options. Plan needs to define the needs for increase in generation, including new facilities. Determination of Indicative Generation Development Plan is completed on the basis of data delivered from generation companies, distribution companies and end users who are directly connected to the transmission system.
- 4.4.2 ISO will once a year prepare an Indicative Generation Development Plan in accordance with the requirements of this Transmission System Planning and Development Code, by end of October, which will cover the next ten (10) calendar years. The plan will be updated each year.
- 4.4.3. The Indicative Generation Development Plan will be based on the following data:
- a) Seasonal maximum and minimum of the electric power consumption in Bosnia and Herzegovina and related electric power demands for each year covered by the study analyses.
 - b) Size and structure of the generation capacities which are capable of supporting the energy and consumption, number and structure of the generation capacities expected to be shut down for more than one year (it is necessary also to note whether the capacities will be disconnected temporarily or permanently), as well as the generation capacities which are in the stage of construction.
 - c) Current generation capacities and those which will be constructed, reconstructed or shut down in the planned period (type of power plant, installed capacity, annual generation, type of fuel, year of a start-up, beginning and completion of the reconstruction, year of closing down).
 - d) Current and future peak generation and consumption of power and energy for the whole of the electric power system and by junction point, taking into account the generation units connected to the user system.
 - e) Information from the distribution development plans provided by relevant parties on the expected growth of the electric power consumption (by category, such as residential, industry, railroad and alike) based on several economic scenarios (low growth, normal growth and high growth of consumption).
 - f) Influence of daily and seasonal curve loads.
 - g) Influence of the increased efficiency of energy usage.
 - h) Influence of the development of power plants toward renewable sources.
 - i) Influence of an export and import potential.
 - j) Influence of possible constraints in the network.

4.5. ISO Responsibilities

- 4.5.1 ISO is responsible for preparing the final version of the Indicative Generation Development Plan, where during the preparation ISO will review proposals from all interested parties. Each interested parties may create independent evaluation and

deliver it to ISO by the end of June of each year in order to include justified proposals in the Indicative Generation Development Plan and in coordination with TRANSCO in Transmission Grid Development Plan.

- 4.5.2. During the preparation of the Indicative Generation Development Plan, ISO will, as much as possible, coordinate and exchange information with the parties which are responsible for drafting the generation development plans.
- 4.5.3. ISO will once a year submit transmission system development plan and the Indicative Generation Development Plan to SERC for approval. After the approval ISO will publish plans and make them available to the stakeholders.

4.6. Planning Data

- 4.6.1. The Transmission System Planning and Development Code requires two types of data to be provided: the standard ones which are required in all cases (Appendix 1) and the detailed planning data in certain cases at the request of ISO or TRANSCO (Appendix 2).
- 4.6.2. The Transmission System Planning and Development Code places the planning data in one of three different status categories, those of confidentiality, implementation and validity.

Preliminary Project Data

- 4.6.3. The data submitted by the user together with a request for connection to the transmission network and exploitation of the network, will be considered as preliminary project data until an obligatory Contract on Connection is drafted between TRANSCO and the user. The preliminary project data will usually contain only the standard planning data.

Executive Project Data

- 4.6.4. When the offer of the Contract on Connection is accepted, the already submitted preliminary project data and subsequent data, requested by ISO and TRANSCO in accordance with this Code, will become executive project data, once approved by ISO and TRANSCO.
- 4.6.5. The executive project data together with other data related to the electric power system available to ISO and TRANSCO will form a basis for the electric power system planning. The executive project data may contain both the standard planning data and the detailed planning data.

Contractual Project Data

- 4.6.6. Contractual project data are part of the Contract on Connection and for the most part have to correspond to Detailed Planning Data.
- 4.6.7. The contractual project data, together with the other data relating to the electric power system available to TRANSCO and ISO, will form a basis for consideration of new

requests by users as well as for the electric power system operation and development planning.

4.7. Appendix 1 – Standard Planning Data

4.7.1. Plan of the User Network

- A single-pole diagram of the user network (current and planned) with basic parameters of equipment and power transformers on voltage levels 110kV and up. For industrial grids connected to the voltage level 110kV and up, provide principal single-pole diagram of supply of large consumers, power plants or compensation instruments (>5MVA).

4.7.2. Consumption Data

For Each User Network:

- For the period covered by the transmission system development plan, projected daily consumption profiles (contains MW and power factor), net generation profile of all generation units directly connected to the user system which does not come under the planning and dispatching of ISO, by hour: peak daily consumption of the user system, the day of peak consumption in the electric power system (active power) as defined by ISO and the day of minimum consumption in the electric power system (active power) as defined by ISO.

For Each User Junction Point:

- Installed power of a network junction point;
- Maximum and minimum power
- Planned annual consumption of electric power;
- Projected daily consumption profiles (daily diagram of active and reactive power during winter and summer operating modes);
- Total active power (of all network junction points) utilized in the user networks (in the previous calendar year and projection for the current year), by the following categories: residential, industry, railroad, public lighting, system user losses, other consumption on low voltage.
- Sensitivity of the individual user consumption to voltage and frequency variations of the transmission system;
- Maximum amount of flickers and contents of the harmonic which the user causes to its consumers at the connection point. During cases when the user possesses industrial furnaces, rolling mills, pull installations and other consumers, which may cause variations in supply of other consumers; it is necessary to deliver particularities on mentioned consumers
- Particulars on cyclic variations of consumption of active and reactive power (>5MVA/min);
- Gradient of change of active and reactive power -increase/decrease (>5MVA/min);
- Proposed manner and time horizon of connection of new consumer point junction on transmission system with necessary technical-economic explanation.

4.7.3. Data on Generation Units and Power Plants

- Points of connection to the transmission system in terms of geographic and location conditions and system voltage;
- Principled single-pole diagram;
- Primary power source;
- Type of generation unit;
- Type of turbine;
- Number of generators and installed apparent power;
- Nominal voltage of the generation unit (generator);
- Nominal power factor of the generation unit;
- Available power on the busbar (MW);
- Possible generation on a monthly basis;
- Maximum and minimum power on the busbar (MW);
- Possibility of regulation of reactive power;
- Capability chart of the generation unit;
- Highest value of own consumption in MW and MVA_r;
- Type of excitation system (rotating or static);
- Type of voltage regulator and system stabilizer;
- Constant of inertia of rotating masses (MWs/MVA);
- Coefficient (ratio) of short circuit;
- Synchronic reactance;
- Transient reactance;
- Subtransient reactance;
- Time constant of dump winding;
- Rated power of block transformer in MVA, transmission ratio, direct and zero reactance, method, range and steps of regulation.

4.8. Appendix 2 – Detailed Planning Data

4.8.1. Plan of the User Network

- Detailed single-pole diagrams of the connection facility;
- Type and arrangement of bus bars;
- Characteristics of the power transformer, regulation selector switches and method of regulation;
- Disposition of the facility (transmission fields, transformer fields, cable fields, transformers, circuit breakers etc.);
- Phase arrangement;
- Grounding system;
- Commutation instruments, metering transformers and metering appliances protection;
- Equipment for reactive power compensation: type of reactive power compensator, nominal voltage, regulation range and method of regulation.

4.8.2 System Data

Every user with the existing or planned network connected to high voltage will submit the following details relating to the high voltage system:

- Type, cross-section and length of the line; including the data on protection of the conductor for air ducts
- Rated voltage (kV);
- Operating voltage (kV);
- Direct reactance;
- Direct resistance;
- Direct susceptance;
- Zero reactance;
- Zero resistance;
- Zero susceptance;

Interconnected transformers between the user high voltage network and main user network;

- Rated power (MVA);
- Rated voltage levels (kV);
- Operating voltage (kV)
- Connection group;
- Direct reactance (highest, lowest and rated at regulation selector switches);
- Direct resistance (highest, lowest and rated at regulation selector switches);
- Zero reactance;
- Range of the regulation selector switches;
- Size of steps of the regulation selector switches;
- Type of regulation selector switches: loaded or in idle motion;

Facility which includes circuit breakers and disconnectors in each of the circuits connected to one connection point, including those at power plants;

- Rated voltage (kV);
- Operating voltage (kV);
- Rated intermittent current of a three-pole short circuit (kA);
- Rated intermittent current of a single-pole short circuit (kA);

4.8.3. Protection Data

The information which relate to the protective instruments on connection points of users on transmission grid:

- Overall description which includes a possibility of adjustment for all protections (relays) and protective systems which were installed or will be installed on the user network;
- Overall description of each of the instruments, which have a possibility for self-disconnection and reconnection, which are connected or will be connected to the user network, including their type and time needed for connection and disconnection;
- Overall description which includes a possibility of adjustment for each protection (relay) and protective systems which were installed or will be installed on the

generation unit, block transformer, network transformers in the power plant and their associated connections;

- For generation units which have (or should have) circuit breakers in the circuit which leads to generator clamps on the same voltage, estimate of the duration of power outages in the capability chart of the generation unit;
- Estimated duration of the most likely outages on the user network.

4.8.4. Grounding System

All the details on the grounding system of star-connection of transformer 110kV and more on the user network, including the impedance values of the grounding.

4.8.5. Estimates of the Transient Surge

In preparation of the studies on coordination of isolation, the estimates of surges should be produced. At the request of ISO or Transmission Company, every user is required to submit to the estimates and projections of the impedance parameters for their own network, relative to the point of connection to the transmission system as well as the data required for necessary calculations.

4.8.6 Harmonics and Flickers

In studying the harmonic and flickers, ISO will have to assess the generation/growth of the harmonics and flickers at the transmission and user systems on 110kV voltage and up. Upon a legitimate request of ISO, users and TRANSCO will be required to submit the additional technical data, as defined by ISO, on the connection locations.

4.8.7. Voltage Changes

In studying the voltage, ISO will need to reassess potential instability of voltage or coordination of the regulation of voltage. Upon a legitimate request of ISO, each user and TRANSCO will be required to submit additional data, as defined by ISO.

4.8.8. Analysis of Short Circuits

When potential short circuit current in the transmission system is higher than 90% of the rated power of the equipment and when ISO and TRANSCO must complete more precise calculation of short circuit current, along with a proposal of appropriate measures.

4.8.9. Consumption of Data

The user is obligated to submit for each point of connection:

- Data on current and projected consumption as stated in the Appendix 1;
- Data on possible consumption cut (MW and MVar), duration in hours as well as the allowed number of cuts in a year.

4.8.10. Data on Generation Units and Power Plants

All power generation companies which are connected to transmission grid must deliver to ISO requested data (4.8.11 – 4.8.16) on their generation capacities, including data on their generation capacities related to supervision of the system and supply of ancillary services.

4.8.11. Own Consumption

It is necessary to submit for each generation unit basic data on its regular own consumption, i.e. needed active and reactive power for starting one generator (block), type and the power of the biggest consumer in the starting phase.

It is necessary to submit for each power plant a principled single-pole diagram of own consumption with a description of the main and auxiliary supply.

4.8.12. Generation Unit Parameters

- Primary power source;
- Type of power plant;
- Type of turbine, GENCO;
- Number of generators and installed apparent power, GENCO;
- Rated voltage on clamps;
- Rated power factor;
- Installed active power (MW);
- Technical minimum (MW);
- Range of voltage regulation;
- Nominal number of rotations;
- Maximum and minimum number of rotations (frequency), time of operation on border values;
- Short circuit ratio;
- Synchronic reactance (d and q-axes);
- Transient reactance (d and q-axes);
- Subtransient reactance d-axis;
- Time constant of excitation winding T'_{do} ;
- Time constant of dump winding d-axis T''_{do} ;
- Time constant of dump winding q-axis T'_{qo} ;
- Time constant of dump winding q-axis T''_{qo} ;
- Stator resistance;
- Stator dissipative reactance;
- Constant of inertia of rotating masses (MWs/MVA);
- Rated current of excitation;
- Rated voltage of excitation;

- capability chart of the generator;
- Saturation curve of magnetizing current.

4.8.13. Block Transformer Parameters

- Rated power (MVA);
- Rated voltage levels;
- Direct reactance (lowest, rated, nominal, at regulation selector switches);
- Direct resistance (lowest, rated, nominal, at regulation selector switches);
- Zero reactance;
- Range of the regulation selector switch;
- Degree of the regulation selector switch;
- Type of the regulation selector switch.

4.8.14. Excitation Management System Parameters

- Type of excitation system and voltage regulator, GENCO;
- Block diagram of the voltage regulation system;
- Values of coefficients of the increase and time constants characteristic of a selected type of the regulator and the excitation system;
- Rated voltage of excitation;
- Lowest voltage of excitation;
- Highest voltage of excitation;
- Voltage change gradient of excitation (rising);
- Voltage change gradient of excitation (falling);
- Particulars on the curve of the excitation described in the block diagram (response time);
- Dynamic characteristics of maximum excitation limiters;
- Dynamic characteristics of under-excitation limiters;
- Type and characteristics of a system stabilizer with a block diagram.

4.8.15. Parameters of the Regulators of Turbines and Boilers

- Type of turbine regulator, GENCO;
- Type of boiler regulator, GENCO (only for thermo-power plants);
- Detailed block diagram with defined coefficients of the increase, time constants and limiters;
- Time required for connection of the unit to the network;
- Gradient of the power increase (MW/min.);
- Range of regulation relative to the working point;
- Dead zone of the regulator.

4.8.16. Additional Data

Not departing from the standard planning data and the detailed planning data which are indicated in the Appendix, ISO and TRANSCO may request additional information from the users. That will be requested when ISO or Transmission Company conclude that the data submitted are insufficient for development of the comprehensive studies of the system.

5. Terms for Connection

- 5.1.1. The Terms for Connection define minimum technical, construction and operational criteria which have to be met by current and prospective users connected to the transmission system. This Code defines the procedures according to which ISO and TRANSCO will issue approvals to the users for connection to the transmission system (110kV and up). TRANSCO defines conditions for connection on voltage level lower than 110kV in its facilities.
- 5.1.2. The procedures based on which ISO, TRANSCO and users may start negotiations on the connection agreement are indicated in the Transmission System Planning and Development Code of this Grid Code. Each agreement on connection requires from the user to meet the requirements of the Grid Code, and TRANSCO will not issue approvals for the connection of the user network to the transmission system until the criteria indicated in this Code are met.
- 5.1.3. The Terms for Connection have been designed in order to ensure that:
- New and remodeled connections do not create unexpected effects on the transmission system or the entire electric power system, or the user network, and are not themselves subject of unacceptable effects of their own connection to the transmission system;
 - All the basic rules of connection treat all users in the same category and in a non-discriminatory fashion.
- 5.1.4. The Terms for Connection are applied to ISO, TRANSCO and users, as follows:
- Power generation companies which are connected to the transmission network;
 - Distribution companies;
 - Consumers whose networks are connected to the transmission system.
- 5.1.5. The parties, which could be classified under one of the above user categories in view of their planned activities, will, as a result of their request for connection to the transmission system, become bound by these Terms for Connection before they start to provide system services and/or generate or utilize power.

5.2. Procedures for Connection

TRANSCO must allow to various user categories contracting possibility for connection in terms of the following:

- New location for connection;
- Existing location for connection;
- Modification on the locations for connection.

5.3. Contracts on Connection

- 5.3.1 Terms and provisions, which define connection to the transmission system, are set forth in the commercial contract of the user and TRANSCO. The Contract on Connection is entered into for each individual point of connection to the transmission system.

- 5.3.2. TRANSCO, having entered into the Contract on Connection with a given user, must guarantee the quantity and quality of services to the user, in accordance with the criteria defined in these Terms for Connection, unless otherwise stipulated in a given Contract on Connection.
- 5.3.3. Before entering into contract, the user must provide to TRANSCO up-to-date data in accordance with the Transmission System Planning and Development Code (and the standard planning data and detailed planning data), as well as the Metering Code. TRANSCO in coordination with ISO, will assess the effect of the proposed connection on the transmission system.

5.4. Request for Connection and the Approval Procedure

- 5.4.1. Users of a new connection point or modification of the existing connection point must submit an official request to TRANSCO, which will coordinate with ISO in assessing the effect of the requested connection on the transmission system.
- 5.4.2. The user will submit complete documentation to TRANSCO in the form of a request.
- 5.4.3. TRANSCO will make and publish standard application forms to enable prospective users to be informed beforehand on the information required.
- 5.4.4. TRANSCO will request from the users to provide all additional information for assessing technical features and costs of the new connection. The costs of the new connection will be borne by the users.
- 5.4.5. TRANSCO and the user are entitled to negotiations in terms of connection provisions and all other issues relevant for the provision of the connection.
- 5.4.6. The extent and complexity of the expansion and strengthening of the transmission system will vary depending on the nature, location and time schedule of the proposed development of the user, which is the subject of the request and which may, in some cases, make ISO and TRANSCO carry out additional systemic studies for a more complete assessment of the effect of the proposed development of the user in the transmission system.
- 5.4.7. For TRANSCO to be able to carry out any of the above mentioned detailed studies, the users may be required to provide some or all the data on detailed planning stated in the Transmission System Planning and Development Code before the usual time schedule, providing TRANSCO shows that it is relevant and necessary.
- 5.4.8. If it is indicated in the request for connection, or if ISO and/or TRANSCO have reasonable grounds to suspect that the user equipment will cause distortions of the shape of the wave, voltage variations or asymmetry on this or some other connection point, TRANSCO must inform the user about the effects of the distortions before the Contract on Connection has been signed. TRANSCO must also provide to the users all the information required to enable the adjustment of equipment for all additional requests.

5.5. Finalization of the Contract on Connection

- 5.5.1. If users wish to accept the terms of the contract for connection, they must take the following steps:
- Inform TRANSCO in writing that they accept the terms of the contract;
 - Provide all necessary data as stated in the Transmission System Planning and Development Code;
 - Recommend start-up program, including commissioning tests, for the final approval from ISO and TRANSCO.
- 5.5.2. The user and TRANSCO must, as soon as possible, no later than thirty days, inform ISO that they signed a Contract on Connection and submit to ISO the details on the proposed metering installation.
- 5.5.3. The data and information contained in the Contract on Connection must be treated as confidential information. The data and information must be protected from publication and must not be accessible to a third party, unless otherwise stipulated in the Contract on Connection, except in allowing ISO and/or TRANSCO to carry out studies and network planning and to assess the effect of the proposed facility on the system's performance, as well as to determine the extent of the demand for ancillary services which must be provided at that connection point.
- 5.5.4. The Contract on Connection obligates the user to, upon completion of the works, prepare a statement on readiness of the new or modified connection in accordance with current laws, after which TRANSCO and the user will organize an inspection of the connection point.
- 5.5.5. TRANSCO will, in consultation with ISO, inform the user whether requirements from the Terms for Connection and Contract on Connection have been met, or state the reasons in case the requirements have not been met.
- 5.5.6. Upon the consent of ISO, TRANSCO will inform the user on acceptability of the proposed start-up program and that the proposed start-up program will not jeopardize the safety and reliability of the transmission system.

5.6. Connection Point Inspection

- 5.6.1. When users find the connection point ready for a start-up, they will inform TRANSCO, which will issue a preliminary certificate on readiness for the program of a joint connection point inspection. The joint inspection program will be prepared by the users and submitted to TRANSCO no later than two (2) weeks before the date set for the inspection. The joint inspection of the connection point and all supporting equipment must be carried out by the user and TRANSCO in order to make sure that the energization of the connection point will not jeopardize safe and stable operations of the transmission system.
- 5.6.2. After the joint inspection of the connection point, the user and TRANSCO will inform ISO in writing on the findings of the inspection. In case it is determined that that connection point is not ready for energization, the user will make the required changes

and/or modification of the connection point and/or equipment and inform TRANSCO on the date of the next inspection.

- 5.6.3. After issuance of final certificate on readiness for the energization is issued by ISO, the connection point will be energized on the date agreed between ISO , TRANSCO and the user.

5.7. Start-up

Before the equipment and instruments which are part of the Contract on Connection become operational, the user will develop procedures which will be approved by ISO and TRANSCO, which will ensure that the start-up is done in a way which will:

- Not have an adverse effect on other users and safety of the electric power system or the quality of supply; and
- Minimize a threat to cause damage to other users.

5.8. Electric Power Quality in the Connection Point

- 5.8.1. ISO and TRANSCO will provide, in accordance with the Contract on Connection, technical, topological and operational standards in the connection point of the user. The users will make sure that their facilities and equipment are in compliance with the requirements set in the Terms for Connection.
- 5.8.2. Frequency, voltage, flickers and harmonic distortions under normal working conditions must meet the requirements of UCTE and ES (European Standards) in terms of quality of electric power in the connection point of the user.

5.9. Frequency Deviation

- 5.9.1. Rated frequency is 50 Hz. Under normal working conditions and work in the interconnection, frequency is maintained between 49.95 and 50.05 Hz. Under disrupted working conditions, frequency may range from 47.5 to 51.5 Hz.

5.10. Voltage Variations

- 5.10.1. Voltage at the connection point of the user to the transmission network under normal conditions will be maintained:
- For 400 kV network between 380 kV and 420 kV,
 - For 220 kV network between 198 kV and 242 kV,
 - For 110 kV network between 99 kV and 121 kV.
- 5.10.2. In disrupted facility, the values of voltage at the connection points of the user to the transmission network may have the following variations:
- In the network 400 kV: 360 - 420 kV,
 - In the network 220 kV: 187 - 245 kV,
 - In the network 110 kV: 94 - 123 kV.

- 5.10.3. Special provisions of the Contract on Connection with the network user may allow, for a particular connection point, major or minor acceptable deviation of voltage from the rated value at the connection point. Bigger deviation of voltage from nominal value on the connection point is allowed only in terms of compliance with procedures on isolation coordination.

5.11. Protection Criteria

5.11.1. Devices for protection from short circuits for all types of equipment (generators, transformers, busbars, HV lines) selectively remove all breakdowns in a fast and efficient manner. Protection devices on transmission grid are designed to be redundant, and equip with main and reserve system for elimination of breakdown (possibly with two protections on the same hierarchical level). Function of the protection may not cause premature outage due to overload or loss of synchronism. Speed and selection during an termination of HV line should be improved by the usage of signal connections between both sides of the HV line.

5.11.2. All users are required to submit to TRANSCO and ISO for approval protection diagrams of their facilities and their settings due to up-dating of the study for adjustment of protection devices on voltage level 110kV and up.

5.12. Time of Protection Action

- 5.12.1. At the request of the user for connection or during the change of conditions for connection, TRANSCO will submit the data on the time required for elimination of a defect or defects at the network junction point, including the recommended method of grounding the elements of the system.
- 5.12.2. The total time of core degree required for the elimination of the defect, including a response of the protective relay, action of circuit breakers, is:
- For transmission lines 400 kV: up to 100 ms;
 - For transmission lines 220 kV: 120 up to 140 ms;
 - For transmission lines 110 kV: 120 up to 140 ms.
- 5.12.3. The users are required to in coordination with TRANSCO set the times of response of their protections to the values higher of the above mentioned. A diagram of coordination (selectivity) of protection of the transmission network and connection points of the user, as well as every change, will be submitted to ISO for the final approval. ISO approval will be based on the basis of results of analyses (transient stability, selectivity...).
- 5.12.4. Technique of the automated reconnection (*APU*) is applied in the *EES* of BiH, as follows:
- In 400 kV network: single-pole *APU* with deenergization of up to 1200 ms, three-pole *APU* is generally not used;
 - In 220 and 110 kV networks: single-pole *APU* with deenergization of up to 1200 ms pause, three-pole *APU* with deenergization of up to 300 ms.
- 5.12.5. Requirements to provide protective equipment will be specified in the Contract on Connection.

5.13. Flickers

5.13.1. According to the definition, it is a disorder of human sight caused by changing the level of light of the light source. This occurs as a consequence of the change of level and frequency of the envelope of the supply voltage of the light source. This phenomenon is most frequently characterized by two amplitude indexes:

- Short duration flicker amplitude index (period of 10 minutes), P_{st} ;
- Long duration flicker amplitude index (12 measurements of P_{st} in the period of 120 minutes), P_{lt} ;

$$P_{lt} = \sqrt[3]{\frac{1}{12} \sum_{k=1}^{12} P_{stk}^3}$$

- The planned values of the flicker amplitude index in the transmission network must not be higher than 0.8 for short flickers and 0.6 for long flickers on the 400 and 220 kV networks and 1.0 and 0.8 for 110 kV.

5.14. Contents of Harmonics

5.14.1. The total harmonic distortion factor, THD(%), is a measurement of participation of sin members of the frequency which is a multiple of the frequency of the main harmonic:

$$THD(\%) = \frac{100}{U_1} \sqrt{\sum_{h=2}^{40} U_h^2}$$

where U_h is an effective (maximum) value of the h harmonic and U_1 effective (maximum) value of the main harmonic.

5.14.2. The highest content of the higher harmonics in the electric power system must not exceed:

- For 400 kV network, the total harmonic distortion of 1.5% with no harmonic exceeding 1.0%
- For 220 kV network, the total harmonic distortion of 1.5% with no harmonic exceeding 1.0%
- For 110 kV network, the total harmonic distortion of 2.5% with no harmonic exceeding 1.5%.

5.15. Phase Asymmetry

5.15.1 Under normal working conditions and planned outages, the maximum value of asymmetry of the operational phase on the transmission system will not exceed 1%.

5.15.2. Under disrupted conditions, a working phase of asymmetry is allowed for a short period of time up to the maximum value of 2%.

5.16. Grounding

5.16.1. The transmission system is an efficiently grounded system if a ground junction factor does not exceed 1.4.

5.17. Levels of Short Circuit Currents

5.17.1. The transmission system has been designed and functions in such a way to maintain the levels of short circuit currents below the following values:

- 40 kA on 400 kV system;
- 40 kA on 220 kV system;
- 31.5 kA on 110 kV system.

5.17.2. All the equipment in the connection point, or the equipment which is part of the transmission system, will be designed in such a way to resist the mentioned values of the short circuit currents, unless otherwise contracted with TRANSCO and ISO. ISO is responsible for calculations of power of short circuit.

5.18. Information on the Connection Point

5.18.1. All user facilities and equipment at the network junction point must meet the agreed technical, construction and operational requirements. Details related to each connection will be provided by ISO and/or TRANSCO at the request of the user. Such information may contain:

- Power flow studies
- Short circuit studies
- System stability analyses (static and dynamic)
- Diagrams of annual and monthly load
- Assessments and statistics of forced transmission line outages.
- Telecommunication network connected at the planned network junction point.

5.19. Equipment and Instruments

5.19.1. Current standards will be applied to all new and modified equipment and instruments at the connection point user/TRANSCO. This will include circuit breakers, disconnectors, grounding instruments, power transformers, voltage and current transformers, reactors, surge diverters, conducting insulators, condensators. Equipment and instruments must be in compliance with all additional requirements as defined by TRANSCO and ISO, which must be complied with within technical specifications and/or which must, as appropriate, supplement technical specifications in order to enable TRANSCO and ISO to meet their obligations.

5.19.2. The users will make sure that the specification of the equipment and instruments at the network junction point are such as to enable the work within applicable technical and safety procedures as agreed on by the user and TRANSCO.

5.19.3 The users will make sure that their equipment and instruments do not cause disruptions in the transmission system from the point of view of higher harmonics, voltage variations, asymmetry and alike, as defined in the Terms for Connection and supporting technical specifications.

- 5.19.4. All the elements of the equipment and instruments at the connection point must be designed, produced and attested, as well as have adequate certificates in compliance with the relevant standards to confirm the quality.

5.20 Technical Requirements for Generation Units

- 5.20.1. Each generation unit must be capable of continuously supplying the maximum power with the frequency of the electric power system ranging from 49.5 Hz to 50.5 Hz, in compliance with the UCTE recommendations.
- 5.20.2. The generation unit must not generate active power, under normal working conditions, susceptible to the effects of voltage change.
- 5.20.3. Each generation unit must be capable of supplying power (MW) to the transmission network at every point of the operating diagram.
- 5.20.4. Excitation systems and voltage regulators of the generation units must maintain voltage within $\pm 10\%$ of the rated voltage.
- 5.20.5. The regulator of the number of rotations of the generation unit must be capable of operating within the technical constraints of the generation unit.
- 5.20.6. The regulator of the number of rotations in coordination with other control equipment must provide for stable generation of active power in the entire operating diagram of the generation unit.
- 5.20.7. When a generation unit connected to the generation unit operates in an isolated mode, and still supplies Consumers, the speed regulator must be capable of maintaining frequency of the isolated system between 47.5 and 51,5 Hz, unless this causes the work of the generator to be below the acceptable technical constraints and exceeding the allowed work time at given frequency levels. All generation units must be capable of providing primary frequency regulation, in accordance with the following minimum requirements:
- Control area of the speed regulator must be at least \pm two percentage (2%) of the registered capacity of the generation unit and must be adjustable according to the ISO instruction;
 - Speed regulator must be capable of adjustments, according to ISO instructions, in order to operate with the total statism between 3% and 4% in case of hydro generation units, and between 4% and 6% for thermo generation units;
 - Speed regulator will not operate within the margins of ± 10 mHz.
- 5.20.8. All generation units must have the excitation system with an automated voltage regulator with continuous effect, including power system stabilizers if they are, in the opinion of ISO, necessary for systemic reasons.
- 5.20.9. All hydropower plants connected to the transmission gird should secure capability of black start (restart). All generation units with an approved capability of the restart will be available to ISO pursuant to the provisions of the Contract on Ancillary Services.

- 5.20.10. Each new hydro-generator of power bigger than 20MW, connected to the transmission grid will be equipped with regulators for providing services of automatic secondary regulation of frequency and power of exchange

5.21. Neutral Point Grounding

- 5.21.1. At the rated system voltage of 110kV and higher, the windings of the generation unit transformers and users instruments connected to transmission system must have the possibility of connection to the ground.

5.22. Subfrequency Relays

- 5.22.1. Distribution companies and buyers connected to the transmission network must install necessary number of subfrequency relays. ISO will define the operational criteria for the action of subfrequency protection, load values (MW) as well as disconnection frequencies, where TRANSCO, Distribution companies and buyers connected to the transmission network implement this function in accordance with technical-technological characteristics of consumers.

5.23. Communication Equipment Technical Requirements

- 5.24. Technical requirements relate to the communication equipment necessary to provide access to necessary instruments and data to ISO, TRANSCO and other users.

5.24. Metering

- 5.24.1. TRANSCO and the users will be responsible for making sure that all connection points are equipped with appropriate metering installations and reliable communications for the transfer of the required information to the database of readings.
- 5.24.2. ISO will supervise and monitor the working conditions of the *EES* in real time. Data in real time will be directed through remote terminals from the locations of TRANSCO and user connections to the ISO's SCADA/EMS equipment and SCADA equipment of TRANSCO where TRANSCO and the users will be responsible for assuring regular, timely, safe and reliable transfer of all necessary data.

5.25. Communication Equipment

- 5.25.1. Every user will provide adequate communication equipment (e.g. fax, e-mail) as defined in the Contract on Connection.

5.26. Location-related Requirements

- 5.26.1. At each location which has the connection point of the user on transmission grid, an operational program must be prepared for all activities, which covers: time and duration of works, description of activities and responsible person. All the works must be organized in compliance with the Safety Rules of TRANSCO and current laws.

- 5.26.2. Each location which has the connection points must have up-to-date and certified implementation of technical documents, which will be available to the user and TRANSCO.

5.27. Contract on Exploitation of the Transmission System

- 5.27.1. Before the delivery of electric power and energy to the transmission system or supply of energy from the transmission system, the user which are not regulated will for every network junction point:
- Sign a Contract on Exploitation of the Transmission System with TRANSCO;
 - Make sure that a relevant network junction point is assigned to the balance responsible party.
- 5.27.2. The Contract on Exploitation of the Transmission System is a contractual arrangement between TRANSCO and the users which are not regulated (non-tariff) for each individual network junction point. The Contract on Exploitation of the Transmission System regulates the provisions and terms according to which the user or a licensed party may utilize the transmission system for the transport of electric power and energy.

5.28. Termination of Connection (Disconnection from Transmission network)

- 5.28.1. TRANSCO and ISO are entitled, without being held responsible whatsoever, to terminate power supply (by disconnection) to the user or disconnect generation power plant:
- In the procedure defined in the Contract on Connection and the Contract on Exploitation of the Transmission System
 - By official orders of other relevant institutions.
- 5.28.2. TRANSCO and ISO are entitled to impose a temporary suspension of the connection without prior notice in the following cases:
- Prevention of threats to health and safety of people or equipment.
 - Accidents in power plants and connection equipment.
 - Failure to fill out the orders from ISO by operational staff of the plant except in instances mentioned in item 7.3.3.
 - Other circumstances outside of the control of TRANSCO and ISO, which are not result of any intentional activity or its violation of contract and are not subject to planning.
- 5.28.3. TRANSCO and ISO are entitled and obligated to temporarily terminate the connection, upon a written notice, in the following cases:
- Revocation of a license of the user.
 - Any changes of technical conditions based on which the connection was made, if those changes would put at risk safety and quality of supply.
 - Planned repairs and reconstructions of the TRANSCO equipment.
 - Failure of the plant to execute the instructions for elimination of significant technical defects on the plant as well as safety-related instructions.
 - Detection of harmful or any other effects on commercial and other metering equipment.
 - Denial of access for the reading and control of the commercial metering equipment.

- All other circumstances, in particular contract violations of consumers who are supplied through regulated manner and only after the acceptance of written notification by the supplier in which it states that it undertook all necessary legal activities which are preceded this measure.

5.29. Voluntary Disconnection

- 5.29.1. The users can request permanent disconnection from the transmission network. Should they opt for the permanent disconnection, unless otherwise agreed, they must submit to TRANSCO and ISO a notice on disconnection at least six months before the disconnection date.
- 5.29.2. TRANSCO will carry out the procedure of disconnection and notify ISO and other users in case it finds that the disconnection procedures may have adverse effects on the connection conditions.
- 5.29.3. The users may disconnect from the transmission network at any point in time under the conditions defined in the ISO procedures.

5.30. Obligation of Reconnection

- 5.30.1. TRANSCO will make sure that the user gets reconnected to the transmission network as soon as possible according to the Contract on Connection.

6. Operational Planning Codes

6.1.1. These Codes refer to ISO, the Transmission company and Users which include:

- (a) Producers (companies which have license for generating electric power);
- (b) Distributors;
- (c) Directly connected consumers.

6.2. Projection of Consumption and Generation

6.2.1. By the end of October of the present year ISO will make yearly Balance sheet for electric power on the transmission network which shall include detailed information on the amounts for the next year. During the drafting of the Balance sheet ISO will coordinate the data with all BRP.

6.2.2. With the view of drafting the yearly Balance sheet on the transmission network, the users must provide to ISO, in a manner and time indicated, the following data:

- Each distributor and directly connected user must submit to ISO, by end of June of each year, objective projections for minimum and maximum levels of power (MW, MVar), as well as minimum and maximum power (MW, MVar) taken from transmission network for each of the following twelve (12) months, starting from January next year.
- Each distributor and directly connected user must submit to ISO, by end of June of each year, objective projections for consumption of electric power (MW, MVarh), as well as the amount of power taken from transmission network for each of the following twelve (12) months, starting from January next year.
- Details from the previous paragraph will be collected for each distribution company and directly connected consumer for the consumption in each consumer junction point. Each distributor will submit monthly data on the generation of units connected to the distribution network as well as losses in the distribution network.
- Submitted data will contain all indications for the planned management measures in terms of consumption (possibility for cuts).
- If in the meantime the projections of a monthly level of power consumption change by more than five percent 5%, the user must report that in writing to ISO no later than 30 days after the change, with a revised plan of the monthly power consumption.
- In their projections, each distribution company and directly connected consumer must indicate possible projected changes of power consumption, which might occur due to new projects which have been planned but not yet implemented.

6.2.3. With the view of drafting the yearly Balance sheet on the transmission network, by the end of June each year each User will submit objective projections for generation of electric power and power for each HPP and each generator in TPP for each of the following twelve (12) months, starting from January next year.

6.2.4. ISO will assess the value of loss for the transmission system at a monthly level, based on the projections of the generation and consumption of electric power, weather conditions and transmission system configuration.

6.2.5. ISO will take into account the following factors when it makes projections of the transmission system consumption:

- Historical consumption data and user data;
- Projections of transmission losses;
- Weather forecast, current and past weather conditions;
- Huge events or activities known to ISO beforehand;
- Expected flows within mutual connections with connected parties;
- Other information by the supplier;
- Projected consumption of the pumped- storage unit.

6.2.6. If any significant changes occur in the Balance sheet parameters, the balance sheet will be revised.

6.3. Planning of Outages/Shut-downs

6.3.1 This section contains the procedures which will enable ISO to make evaluation of system safety during specific time periods in order to harmonize projected consumption with generation and availability of transmission network, that is UCTE operational security standards.

Long-term Maintenance Outages

6.3.2. Long-term outages due to maintenance works are projected in the annual maintenance program contained in the annual overhaul plan. By end of September of current year (0 year) TRANSCO and ISO will coordinate their plans for outages due to maintenance works on the electric power system in order to have an annual overhaul plan for the upcoming year (1 year). The dates of disconnections must be submitted with

- Fixed duration of disconnection;
- Period in which disconnection will be made.

6.3.3. During the preparation of the annual plan, ISO will do everything it can to adjust to the requirements for the planned disconnections of transmission network's and users' structures. In cases when the requests of the users cannot be met for legitimate reasons, additional consultations will be made between ISO, TRANSCO and the user in order to make an appropriate annual plan. Under these circumstances, ISO is authorized to make a final decision.

Chronology of Harmonization of Long-term Outages due to Maintenance Works on the Electric Power Structures:

6.3.4. End of July: TRANSCO and the users will submit a preliminary draft of the annual plan (0 year) to ISO.

6.3.5. End of September: ISO will make consultations with TRANSCO and the users in order to include the changes in the preliminary draft of the annual plan and will make a final draft of the annual plan which it will then submit to TRANSCO and the users, whose overhaul programs differ from those in the preliminary draft of the annual plan.

6.3.6. End of October: Harmonization of plans with the operators of the neighboring systems.

- 6.3.7. End of November: Conclusion on the regional plans and publication of the annual plan.
- 6.3.8. Requests for long-term disconnections due to maintenance works, which were once approved by ISO, may be modified only by:
- a) Timely notice of ISO on the change of time of the beginning of disconnection in order to ensure reliable supply or operational safety of the electric power system;
 - b) Agreement between ISO and Party in charge of operation of generation units in cases when those changes effect only that particular generation unit;
 - c) Agreement between ISO and directly connected consumers in cases when such changes affect only that particular consumer;
 - d) Agreement between ISO and TRANSCO in cases when such changes affect only TRANSCO;
 - e) Agreement between ISO and DISCO in cases when such changes affect only that particular DISCO;
 - f) Agreement between GENCO and TRANSCO, if approved by ISO, with an assessment of the effect of such an arrangement on system conditions.
 - g) Approval of the request from UCTE and the operator of neighboring systems when the change of time of disconnection affects those systems.
- 6.3.9. TRANSCO and users are obliged to confirm the plan for long-term outages 7 days before the beginning of the month in which the outages will be carried out, or propose possible change.
- 6.3.10. TRANSCO and users will ask ISO for written consent at least two days before the beginning of work planned for that month.

Short-term Maintenance Outages

- 6.3.11. Short-term disconnections due to maintenance works are a planned unavailability, which is not time specified in the annual plan. The time of the beginning and duration of a short-term outage due to maintenance works must be approved by ISO for the structures which it did not hand over to the TRANSCO jurisdiction. TRANSCO must obtain consent from the User if it causes outage to the User.
- 6.3.12. For disconnections shorter than one day, it is sufficient to submit a notice no later than two (2) working days before it begins, that is three (3) working days if the outage causes interruption in the supply of electric power to consumers.

Unplanned Outages

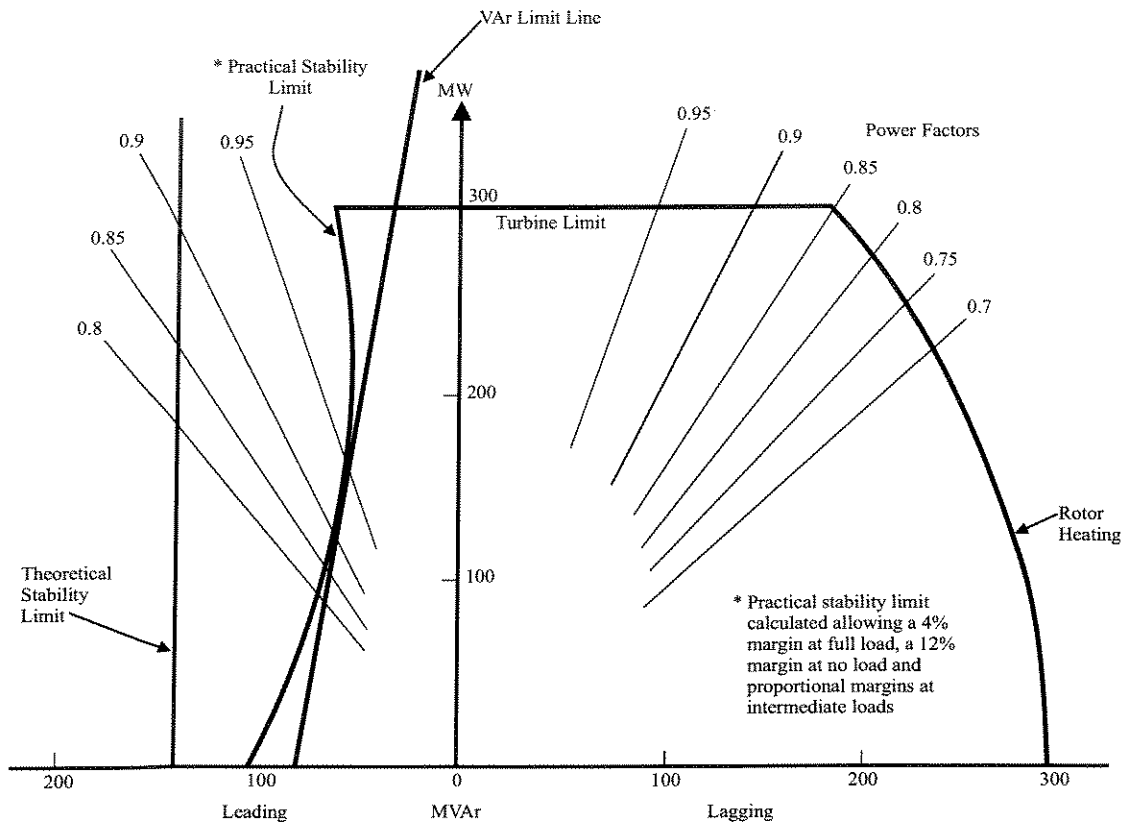
- 6.3.13 When, due to unavoidable circumstances, TRANSCO or the user have the need to make an unplanned disconnection, they have to, as soon as possible, inform ISO and seek its consent. The request for consent must contain:
- All the details on the equipment and instruments to be disconnected and possible effects;
 - Likely date and time of the beginning and end of the unplanned disconnection.
- 6.3.14. ISO may request from TRANSCO or the users the changes related to the unplanned disconnection when, in the opinion of ISO, that unplanned disconnection may seriously

effect the security of the electric power system. If TRANSCO or the user agrees with an alternative recommended, ISO must send a written notice with a new date and time of the unplanned disconnection.

Forced Outages (Disconnections)

- 6.3.15. In case that a generation unit or some transmission network elements are affected by a forced outage (disconnection), ISO will be informed about the incident as soon as possible. TRANSCO or the user should assess a likely duration of the forced outage and present all the necessary details to ISO. In case the assessments of the time and date of reconnecting to the normal operating mode cannot be made together with the initial report on the disconnection, TRANSCO or the user will inform ISO about the matter as soon as possible.
- 6.3.16. In case that a forced outage of transmission network elements has as a consequence failure of supply of Distributor, ISO or TRANSCO will notify the Distributor in question on the reasons and preliminary assessment of duration of the outage.

Section 0 - Appendix 1: Capability Chart of Generation Unit



6.4. Balance Responsible Parties

- 6.4.1. This Section refers to procedures for nomination of Schedule of Balance responsible parties to ISO BiH. Proces of making the Schedule refers to each Balance responsible party and all licensed parties. The aim of this Section is to enable ISO to prepare compiled Schedule based on Schedules of Balance responsible parties and obligations of providing Ancillary services.
- 6.4.2. All bilateral exchanges of the licensed parties must be reported to ISO in the frame of Schedule of BRP, to the extent necessary for the management and balancing of the system. Based on the Schedules of BRP and information on bilateral transactions ISO shall calculate and allocate to BRP imbalances occurring due to deviations in the planned exchanges, in compliance with the Market Rules.

Balance Responsibility

- 6.4.3 All licensed parties which assume a Balance Responsibility must be registered with ISO as Balance Responsible Parties (BRP) and must undertake the Balance Responsibility toward ISO, which means that the sum of their generation, purchases, consumption and sales, as the case may be, must always be in balance.
- 6.4.4. In order to facilitate the operations of the electric power system of BiH, licensed parties may transfer their Balance Responsibility to a Balance Responsible Party.
- 6.4.5. Every connection point of a generation company, end consumers and distribution network to the transmission system must be assigned to a Balance Responsible Party.

Obligations of Balance Responsible Parties

- 6.4.6. Every Balance Responsible Party is undertaking to plan for every defined time interval so that the generation and purchases of power match the projected consumption and sales.
- 6.4.7. Every Balance Responsible Party must submit Schedule and likely modifications to ISO.
- 6.4.8. Every Balance Responsible Party will be responsible to ISO for the total imbalances between generation, purchases, consumption and sales of all licensed parties for which it is responsible.

Registration and Withdrawal of Balance Responsible Party

- 6.4.9. Every licensed party that has right to form a Balance Responsible Party will notify ISO in writing, so that it can be entered into the register of BRP.
- 6.4.10. After entering the Balance Responsible Party in the register of Balance Responsible Parties ISO shall inform TRANSCO, other Balance Responsible Parties and licensed parties which are assigned to this BRP on the date when the new Balance Responsible Party will be authorized to participate in the time planning process.

Transfer of Balance Responsibility

- 6.4.11. Licensed parties will have to transfer their Balance Responsibility to a licensed party that is registered as a Balance Responsible Party.
- 6.4.12. A licensed party which wants to transfer its Balance Responsibility and a Balance Responsible Party that accepts the Balance Responsibility must inform ISO in writing as to who will the Balance Responsibility be transferred to.
- 6.4.13. Once ISO approves the transfer of the Balance Responsibility, it will register this change in the register of Balance Responsible Parties and the register on exploitation of the system and will inform the following parties:
- a) System user and the licensed party which requested the transfer of the Balance Responsibility;
 - b) Balance Responsible Party which had the Balance Responsibility before;
 - c) Balance Responsible Party accepting the Balance Responsibility.

Register of Balance Responsible Parties

- 6.4.14. ISO will prepare and maintain the register of Balance Responsible Parties.
- 6.4.15. All Balance Responsible Parties will be registered in this Register of Balance Responsible Parties. The Register of Balance Responsible Parties will, as minimum, for each Balance Responsible Party, contain the following information:
- a) Name and/or code of a Balance Responsible Party (for operational purposes);
 - b) Full name and address of the licensed party which founded a Balance Responsible Party;
 - c) Contact details; and
 - d) All other information as provided for in the Market Rules.
- 6.4.16. ISO will publicize the Register of Balance Responsible Parties and will inform TRANSCO and the Balance Responsible Parties on any changes in the Register of Balance Responsible Parties.

6.5. Time Planning

Schedules

- 6.5.1. Every Balance Responsible Party will, not later than 13:00 hrs every day, submit to ISO an Schedule for the scheduled day (the following day). Prior to non-working days, the Balance Responsible Parties will submit the Schedules for all subsequent non-working days and the first following working day.
- 6.5.2. In agreement with ISO, Balance responsible parties can submit new versions of Schedule not later than 14:00 hrs (deadline for submitting a Schedule) of the day prior to the scheduled day. If BRP do not submit the Schedule timely or if conditions in EES require, ISO has the right to declare as valid the last acceptable version of Schedule, dismissing all later versions of Schedule.
- 6.5.3. The first Schedule submitted to ISO will be identified as version n.1.
- 6.5.4. If a Balance Responsible Party submits revised Schedules in the time for submission of the Schedule, every newly submitted Schedule will be marked by the next higher number of the version. The Schedule with the highest version number, submitted to ISO in the time for submission of the Schedule and approved by ISO, will replace all the Schedules previously submitted.
- 6.5.5. ISO will confirm the receipt of every Schedule to the Balance Responsible Party submitting the Schedule, including the version number and time of receipt. In case that a Balance Responsible Party does not receive this acknowledgment of receipt, it will verify with ISO whether the Schedule submitted by this Balance Responsible Party has been received by ISO.
- 6.5.6. It is possible to submit the Schedule maximum one (1) month before the scheduled day.

Verification and Approval of Schedules

- 6.5.7. After the time for submission of the Schedule, ISO will, for each Balance Responsible Party, verify validity of the Schedule.
- 6.5.8. ISO will declare a Schedule invalid in the following cases:

- a) If a Schedule was not submitted in the time for submission,
 - b) If a Schedule does not match the format and contents;
 - c) If it received more than one (1) Schedule with the same highest version number;
 - d) When a Schedule contains exchanges, including import and export, over the assigned capacity of a nominated Balance Responsible Party or that of users in that Balance Responsible Party;
 - e) If a Schedule contains the exchange with another Balance Responsible Party with a nominated exchange that is different the Schedule nominated by that Balance Responsible Party in its Schedule;
 - f) If a Schedule contains the exchange with another Balance Responsible Party within published network constraints inside BiH.
- 6.5.9. Every Schedule approved by ISO becomes binding for a given Balance Responsible Party.

Treatment of Invalid Schedules

- 6.5.10. In case ISO declares an Schedule invalid, it will inform the Balance Responsible Party that nominated it that it was rendered invalid and will provide reasons for such a decision. The Balance Responsible Party will then nominate a corrected Schedule.
- 6.5.11. Upon receipt of the corrected Schedule, ISO will verify its accuracy. If the corrected Schedule is found valid it becomes the approved Schedule of that Balance Responsible Party.
- 6.5.12. If a Balance Responsible Party fails to submit the corrected Schedule within a given deadline, or if the corrected Schedule is again found invalid, ISO may adjust the corrected Schedule in the following fashion:
- a) Review the Schedule with the highest version number which was received last in a corrected form;
 - b) Exchange will be adjusted to the lower nomination if both BRP nominate exchange in the same direction, that is to zero if the directions are different;
 - c) Exchanges, including exports and imports, will be reduced to the assigned capacity of the nominated Balance Responsible Party or that of users in that Balance Responsible Party.
- 6.5.13. The adjusted Schedule as the case may be, will become the approved Schedule and binding for the Balance Responsible Party.

Notice on Approved Schedules

- 6.5.14. ISO will inform the Balance Responsible Parties about the acceptance of their Schedules including the changes. If the Schedule or corrected Schedule has been adjusted by ISO, ISO will inform a given Balance Responsible Party about the approved Schedule.
- 6.5.15. If a Balance Responsible Party does not receive a notice from ISO on the approval or adjustment of its Schedule by 14.30 hrs, it will phone ISO in order to receive a written acknowledgment of receipt.

Revised Schedules

- 6.5.16. Having received several notices on incidents in the system, ISO may, if the situation so requires, decide to postpone the acceptance and approval of all modified Schedules and inform a Balance Responsible Party on the matter.

Contents and Format of Schedules

- 6.5.17. Contents and format of the Schedule will be defined by ISO, and will be in compliance with the UCTE and ETSO rules and its minimal contents will be, in the frame of appropriate time resolution:
- projected generation of TPP by its units and HPP;
 - projected consumption;
 - projected reception/delivery of energy;
 - projected generation of electric power for covering up of losses in transmission.

Intra-day harmonization of Schedules

- 6.5.18. In case of a change in Schedule during the day, BRP must submit new Schedules to ISO not later than 60 min before starting of the Schedule, its realization starting at least a full hour later. If BRP do not submit information to ISO in time, or if the new Schedule is not harmonized between relevant participants, or if the conditions in EES do not permit changes of already accepted Schedule, ISO has the right to change the Schedule. Notice on approval or disapproval of the Schedule ISO will deliver to BRP not later than 15 before Schedule enters into force.
- 6.5.19. If tertiary reserve is activated, ISO will change Schedule for the Party that activated the tertiary reserve and Party for which it has been activated in the first hour in time intervals of 15 min.
- 6.5.20. In case of over-engagement of tertiary reserve for other TSO, ISO will act according to UCTE procedures.

Verification and Approval of Day ahead Schedule

- 6.5.21. In preparing day-ahead Schedule, ISO will take into account the following factors:
- a) Exchange programs submitted by Balance Responsible Parties;
 - b) Operational plans for generation units;
 - c) Transmission constraints;
 - d) Provisions of the Ancillary Services Contracts;
 - e) Security assessment including the need to secure the operational margin;
 - f) Provisions on a possible division of the electric power system into the “insular” operating mode, which requires synchronization of additional generation units.

6.6. Information Publication

On its web-site, ISO will publish the following information for each network limit:

- a) Interconnection capacities (ATC) within a defined timeframe, using UCTE methodology;
- b) Mechanisms of assignment of ATC;

- c) Assignment outcomes;
- d) Network limits.

6.7. Management of Network Constraints

Determination of Available Capacities

- 6.7.1. ISO will calculate and publish the following values separately for each direction and limit in accordance with the procedure on allocation of over limit capacities. Procedure on appointment of over limit capacities shall be published on the ISO web-site.
- 6.7.2. ISO shall calculate Total Transmission Capacity (TTC) and harmonize it with neighboring system operators taking into account safety criteria.
- 6.7.3. Net Transfer Capacity (NTC) is a positive difference between TTC and TRM

$$NTC = TTC - TRM$$

- 6.7.4. Available Transmission Capacity (ATC) represents a value of NTC which is still available, i.e. a positive difference between NTC and AAC

$$ATC = NTC - AAC$$

- 6.7.5. In case of network constraints, ISO will provide up-to-date values. ISO will identify all transmission lines and parts of the transmission system that could be affected by this constraint, defining a network limit.
- 6.7.6. In order to provide the integrity and security of the electric power system, ISO is authorized to partially or completely terminate all imports and exports that contribute to the unexpected network constraint by giving a timely notice and afterwards a written explanation.
- 6.7.7. In the event of internal constraints, with the aim of ensuring integrity and safety of electro-energetic system, ISO is authorized to do congestion-caused re-dispatching by the means of dispatching orders. Fines for congestion-caused re-dispatching are defined by Market rules.

6.8. Submission of Data by Providers of Ancillary Services

Submission of Data

- 6.8.1. All stakeholders in the Balance Market and providers of Ancillary Services will in compliance with the Market Rules submit to ISO all relevant noncommercial information related to Ancillary services and bilateral contracts.
- 6.8.2. Timeframe, format and contents of the information will be defined by ISO.
- 6.8.3. All licensed parties have to submit the planning parameters related to generation and dispatching to ISO for all generation units that have capabilities to provide ancillary services.

- 6.8.4. ISO must be informed on each new factor that, in the opinion of ancillary service providers, may effect the generation of the unit which provides ancillary services..

Insufficient Supply

- 6.8.5. If a Balance Responsible Party does not meet its contractual obligations or the exchange set forth in the approved Schedule it is required to undertake all necessary measures to cover those deficits, including the cut of its delivery to other parties and/or increase of its generation and/or purchase of power from other parties and/or as a final measure to decrease its own consumption.
- 6.8.6. The Balance Responsible Party must inform ISO on all the measures undertaken and if it decides to undertake the measure of restriction in supply it must notify the consumers.

Determination of Imbalance and Financial Settlement of Imbalance and Transmission Losses

- 6.8.7. Balance determination and its allocation to individual BRP for each dispatching period will be defined by Market Rules.
- 6.8.8. Loss compensation costs in the transmission system will be assigned in proportion to the share of consumption of each BRP in the total consumption. Each BRP will be obligated to enter into its Schedule its generation of electric power for the coverage of losses in the transmission system.

6.9. Appendix A: Parameters of Time Planning and Dispatching

Planning Parameters of Generation and Dispatching (PPPD)

Planning parameters of the generation and dispatching for each generation unit connected to transmission network, will, as a minimum, contain:

- a) Basic data;
- b) Minimum and maximum power in MW;
- c) Statism of the regulator (%);
- d) Capability of an automated generation control (AGC);
- e) Constraints in the number of starts by scheduled day;
- f) Minimum starting time;
- g) Minimum closing time;
- h) Capability levels of generation in MW and MVar in which a generation unit may function as indicated in an appropriate diagram of the generator (Capability chart).

7. Operational Codes

These Codes refer to ISO, the Transmission company and Users which include:

- (a) Producers;
- (b) Distributors;
- (c) Directly connected consumers.

7.1. Dispatching

- 7.1.1. ISO has the final responsibility in assisting the operations of the electricity market for the benefit of all stakeholders in the market and end consumers as stipulated in the Law on Transmission of Electric Power and the Law on Establishment of ISO.
- 7.1.2. In order to make meaningful decisions related to safe and reliable operations of the electric power system, ISO must know, at any given time, the electric topological structure of the system as a whole as well as the overall status of the equipment in the system. ISO must monitor the electric process parameters of the system (voltages, power flows, power plant current output capacity, current consumption, deviation of power of exchange toward adjacent systems, regulation requirements, frequency, effects of power protection and alike), as well as keep the statistics of mechanical incidents.
- 7.1.3. The System Operator must supervise all the works performed on the network that affect its topology and transmission capabilities. The System Operator supervises the above elements and process values of the electric power system using a system of the process IT.
- 7.1.4. ISO is responsible for:
 - a) Managing operation of all high-voltage equipment in BiH of voltage level 110 kV and more
 - b) Issuing guidance for dispatching to producers and importers;
 - c) Balance market management;
 - d) Frequency maintenance;
 - e) Voltage maintenance and;
 - f) Reenergization.
- 7.1.5. ISO provides the above functions to the transmission network users by supervising the defined Schedules and utilizing Ancillary Services of those network users who have the capabilities and appropriate equipment.
- 7.1.6. The interconnected system places an obligation on ISO to plan sufficient capacity for the provision of System services in accordance with the rules of operation of the UCTE in its own system or leasing from other control areas.
- 7.1.7. ISO manages Balance market and ensures that all Ancillary Services are provided. Those Ancillary Services are a subject of contracting between ISO and Service provider..
- 7.1.8. ISO negotiates the provision of Ancillary Services with users which have required equipment and capabilities. Price of Ancillary Services is defined by SERC tariffs.
- 7.1.9. Users that contract the provision of Ancillary Services report to ISO on the status and availability of all generation units and equipment that will provide the contracted

services. Based on those data as well as the current demand for System Services, ISO will use necessary contracted Ancillary Services of the network user in accordance with technical requirements.

7.2. Procedures

User's Responsibilities

- 7.2.1 Every Balance Responsible Party in BiH has a full responsibility for its planned generation, exchange and consumption, including the responsibility to cover respective shares of transmission losses.

Revision

- 7.2.2. ISO will make sure that all dispatch instructions are kept in an appropriate form in accordance with provisions of the Law which regulates this area and internal acts of ISO. TRANSCO and every user may request access only to the information relating to their own equipment and instruments.

Dispatching in Real Time

- 7.2.3. Control of the energy balance in BiH system will be performed according to the approved Schedules. All BRP are requested to follow the approved Schedules..
- 7.2.4. The transmission system user is required to ensure the fulfillment of its programs that had been submitted to ISO through BRP in the frame of Schedules.
- 7.2.5. With the aim of ensuring self sustained balance BRP must have all necessary information in real time that are needed for monitoring its own balance mistake, as well as BiH mistake. On request these will be provided by ISO.

Dispatch Orders/Instructions

- 7.2.7. ISO is responsible for issuing dispatch orders/instructions to BRP that does not follow the approved Schedule..
- 7.2.8. Dispatch orders/instructions that relate to the scheduled day may be issued by ISO at any point in time after the approval of the Schedule relative to that scheduled day, only in the case of danger for the system safety.
- 7.2.9. ISO is responsible for the system frequency management. To adjust the system frequency ISO will use the services contracted with Ancillary Service providers. The Ancillary Service providers have to acquiesce to all orders of ISO in accordance with the contracts on Ancillary Services.
- 7.2.10 ISO is responsible for the management of reactive power and maintenance of voltage.
- 7.2.11. ISO issues dispatch orders/instructions for:

- a. Manipulation of commuting equipment on the transmission network in accordance with the hierarchy of management agreed with TRANSCO;
- b. Engaging Ancillary services according to The Agreement on Ancillary Services;
- c. A change in the reactive power generation of the generation unit or an instruction for maintenance of a given level of voltage of bus bars in compliance with technical abilities defined in the Contract on Connection.
- d. Activating/shutting-down and regulation of the equipment for reactive compensation (capacities/reactor/ SVC/ change of the position of transformer switch)

Frequency Maintenance

- 7.2.12. In order to maintain the frequency within acceptable margins, when a system operates in an isolated mode (separated from the interconnection), ISO is obligated to provide a sufficient reserve of power for primary regulation and secondary regulation.
- 7.2.13. In the interconnection, ISO must maintain a primary reserve, secondary reserve as well as tertiary reserve in compliance with the UCTE rules of operation and take measures for the safe transmission of the highest planned load increased by the transmission of power of primary and secondary regulation. Consequently, ISO will mandatorily establish and plan the capabilities of transmission and topological structure of the transmission network.
- 7.2.14. Under normal working conditions, frequency must be maintained within strict margins (within ± 50 MHz of the rated frequency) in order for complete and timely response of regulation equipment and generation units to disruptions.
- 7.2.15. Deviations from the normal frequency by more than 50 MHz are rectified by an effect of primary regulation and, if required, by activating the capacity of the secondary regulation.
- 7.2.16. Provision of tolerant frequency values, under the insular operating mode and under abnormal working conditions in case of large-scale disruptions, will be defined in a plan of subfrequency unloading.
- 7.2.17. In the interconnection, ISO must comply with the UCTE requirements related to frequency maintenance. In case of disruptions, it cooperates to assist other control areas of the interconnection with its primary regulation capacities in frequency maintenance.

Primary Frequency Regulation

- 7.2.18. All generation units connected to the transmission network must participate in the primary regulation and must set statics of primary regulators to the set values and keep the regulators unblocked.
- 7.2.19. Setting the statics of the primary regulators should be in the range of 3-4% for hydro generator and 4-6% for thermal generator.

- 7.2.20. In the interconnection, EES of BiH, as a single Control Area, must provide a set reserve of primary regulation at any time, in compliance with its share of generation in the total UCTE generation.
- 7.2.21. The range of primary regulation has been defined by the value of active power in which the system that regulates the speed of the mechanism operates in both directions automatically in case of frequency deviation. That is the power which has to be provided in accordance with the coefficient of contribution and current disconnection of the generation unit, power which is lower or equal to 3000 MW in the UCTE interconnection, according to the equation:

$$P_i = c_i P_U = \frac{E_i}{E_U} P_U \quad [\text{MW}]$$

Where:

E_i = total output power on the busbar of all generation units of the i Control Area [MW]

E_U = total output power on the busbar on all generation units in the UCTE interconnection [MW]

P_U = 3000 MW.

Secondary Regulation of Frequency and Power of Exchange

- 7.2.22. The objectives of the secondary regulation of frequency and power of exchange are:
- Realization of the planned program of power exchange between BiH and neighboring systems in the interconnection,
 - Take over frequency regulation from the activated primary regulation reserve as well as renewal of the required primary regulation reserve,
 - Returning the system frequency to the set value.
- 7.2.23. Secondary frequency regulation is a system service at the level of the electric power system with a minute response in order to maintain the desired power of exchange and frequency in the interconnection, i.e. only the frequency in an isolated mode of the Control Area or a part of the electric power system. It is achieved through a system of regulation of the speed of generation units and active power group regulators of the power plant, if installed in the power plants with several generation units. It is calculated using an empirical equation defined by the UCTE:
- $$R = \sqrt{aL_{\max} + b^2} - b \quad [\text{MW}]$$
- Whereby:
- $a = 10$ i $b = 150$;
- R = required secondary reserve [MW]
- L_{\max} = max. consumption power of the control area for a given period [MW].
- 7.2.24. Based on the values of L_{\max} from the power balance, ISO will calculate the required level of secondary reserve for the EES of BiH. That information will be public.
- 7.2.25. All producers whose power plants have technical capabilities for automatic secondary regulation are obligated to indicate capabilities of their generators in their power balance. The producers whose generators get selected for the automatic secondary regulation will

make an Agreement on Ancillary Services and will be adequately remunerated for it in accordance with the Tariff Methodology and Market Rules.

7.2.26. Producers that have signed the Agreement on Ancillary services will deliver the secondary regulation power from plants mentioned in the item above. In accordance with that Agreement, the service will be activated automatically upon request from ISO by sending an impulse from SCADA/EMS system in the center of ISO:

- e. Directly on the group or individual regulator of the plant which is in the regulation or
- f. On the controller of the centers for control management that, following the logic of division, transmits the signal to the plants that are in the regulation.

7.2.27. Criteria for ensuring the quality of secondary regulation power will be regulated by the Agreement on Ancillary services, and will be defined in accordance with the UCTE operational manual.

Tertiary Reserve

7.2.28. Tertiary reserve will be employed within 15 minutes from the moment when a dispatch order is issued.

7.2.29. Tertiary reserve is used in order to assist the secondary regulation by creating a required regulation range for it.

7.2.30. Tertiary reserve should cover the outage of the biggest generation unit. ISO will determine the required tertiary reserve at a monthly level based on the data from the balance. These values will be public.

7.2.31. Criteria for employing tertiary reserve will be a mistake in the system of BiH in the amount of 50 MW in the time period of 15 min. ISO dispatcher will issue an order for activating tertiary reserve in the amount: the mistake plus positive size/scope of the secondary regulation. During calculations ISO will charge BRP for the employment of tertiary reserve in the percentage of their share in the overall BiH mistake in the period of those 15 min.

7.2.32. After issuing dispatch orders for the activation of tertiary reserve, ISO will, in the first hour in the intervals of 15 min, change the Schedule of BRP which activated the tertiary reserve and BRP for which the tertiary reserve was activated.

7.2.33. The Agreement on Ancillary services will define minimum and maximum usage time of the reserve after the activation, maximum number of activations in a month and minimum time that must lapse between two activations.

7.2.34. The Agreement on Ancillary services will define the cases which are considered disobedience of orders issued by ISO for the activation of tertiary reserves.

7.2.35. All generation companies whose plants have technical capabilities for tertiary regulation are obligated to submit in their power balance their capabilities for the tertiary regulation for the following year by months. Generation companies whose plants get selected for

tertiary regulation will make an Agreement on Ancillary services and will be appropriately reimbursed according to Tariff Methodology and Market Rules.

- 7.2.36. In case the required reserve cannot be provided in its own EES, ISO will take steps to provide the required level of reserve from other Control Areas through contractual arrangements, as appropriate.
- 7.2.37. ISO will not allow any generation company to contract the sales of tertiary reserve to other TSOs until the tertiary reserve is provided for the needs of the EES of BiH. The activities on the provision of tertiary reserves for the needs of the EES will be finished by the end of August of the current year for the following year.

Maintenance of Voltage and Delivery of Reactive Power

- 7.2.38. In order to maintain security and integrity of the EES of BiH, ISO manages voltage levels in the transmission system and maintains them within acceptable margins.
- 7.2.39. ISO will issue dispatch orders for the management of available capacities, inductive reactive sources (generators, transmission lines, compensators etc.) as well as orders for changing the position of the regulation selector switch of the transformer in order to maintain system voltages within set margins according to the UCTE rules. If the reactive resources are insufficient, ISO may decide to cut consumption in order to prevent voltage breakdowns.
- 7.2.40. At the request of ISO, all available reactive resources are obligated to submit the required data on the status of the voltage regulator, position of the regulation selector switch of the transformer, 400 and 220 kV.
- 7.2.41. All power generation companies are required to provide technical characteristics of their generation units for the regulation of voltage and reactive power, as provided in the Terms for Connection, as a mandatory Ancillary Service for ISO.
- 7.2.42. Every generation unit is obligated to generate reactive power to the extent defined by the capability chart. Reimbursement of costs for the delivery of reactive power to the system has been defined in the Market Rules.
- 7.2.43. In the process of daily operational planning, ISO must be informed about (un)availability of a given reactive source.

7.3. Communications

- 7.3.1. ISO will define the format and contents of dispatch instructions/orders which will be issued in cooperation (consultation) with TRANSCO and User.
- 7.3.2. A person who receives an order in form of a dispatch instruction/order will repeat it in order for the person issuing the order to be sure that the order was properly understood. The person who received the order is allowed to act on it only after receiving a confirmation from the person who issued it.
- 7.3.3. The user or TRANSCO may refuse a dispatch instruction/order for safety reasons – related to staff or equipment – or due to invalid dispatch instruction/order, giving an appropriate explanation.

- 7.3.4. Under no circumstances can a valid dispatch instruction/order issued by ISO to the user of TRANSCO be ignored for commercial reasons.
- 7.3.5. In case an unexpected problem occurs during the implementation of the dispatch instruction/order, which affects the safety of the people and equipment, ISO must be informed about the matter immediately.
- 7.3.6. In case of a loss of all forms of communication, TRANSCO and the user must work as responsible and prudent operators and under no circumstances will they manage the power plant outside of its safety margins, and will maintain the system frequency of 50 Hz and given voltage levels.
- 7.3.7. In case of interruption in communication or broken communication, the affected parties will take all necessary steps to reestablish any kind of communication.

8. Code of Measures in Unexpected Situations

8.1.1. ISO is responsible for preservation of the system's security in unexpected (pre-emergency and emergency) operating modes. Taking into account technical features of transmission system and User, ISO will define detailed measures and procedures for guarding the system from major disruptions that may lead to disintegration of the system accompanied by partial or total breakdown, as well as the procedures for restoration of the system after major disruptions. In unexpected situations, ISO is responsible for carrying out the following.

8.1.2. These Codes refer to ISO, the Transmission company and Users which include:

- (a) Distributors;
- (b) Producers of electric power;
- (c) Directly connected consumers.

8.2. Consumption Control

8.2.1. Distributors and directly connected consumers must comply with the measures of consumption cuts, which ISO may take in order to preserve the system's security and unhindered supply of priority consumption.-

8.2.2. In implementing the consumption cut measures, ISO will take a non-discriminatory approach toward buyers of electricity on the transmission network and use them only after other measures for preservation of the system's security have been taken.

Consumption Control Methods

8.2.3. The consumption control includes:

- Automated subfrequency unloading.
- Load reduction initiated by ISO.
- Voltage reduction initiated by ISO.

8.2.4. ISO will agree with distributors and directly connected consumers all the details related to the controlled unloading of consumption by voltage reduction and/or partial or complete disconnection of consumers and/or network users.

User Voltage Reduction

8.2.5. In case of danger of a voltage collapse, ISO together with TRANSCO and the transmission network users will apply the measures of voltage reduction to the end consumers of up to five percent (5%) of the rated voltage. In such cases, ISO will issue instructions to TRANSCO to change the position of the regulation switch of the transformer at certain points of the system.

Load Reduction Initiated by ISO;

8.2.6. In case of disruptions in the EES in BiH which put at risk the system's security and which are estimated to last for a longer period of time, ISO will request load reduction of the transmission network users. Under such circumstances, depending on the extent of

the disruption, ISO will in consultation with the distribution network operators prepare a plan of load reduction, which will contain the amount of reduced power and energy, and, as required, a cyclical order of users to undergo the consumption cut.

Automated Subfrequency Unloading;

8.2.7. The distributors and consumers connected to the transmission network are obligated to prepare plans of subfrequency protection, which contain a classification of consumers by degree of their priority, technological characteristics and power. An automated subfrequency unloading is achieved by using subfrequency relays, which must have differential and time part with four degrees of frequency drop as indicated in the table:

Degree	Frequency	Reduced Load (%)	Cumulative Load (%)
I	49.2	10	10
II	48.8	15	25
III	48.4	15	40
IV	48.0	15	55

8.2.8. The percentage of automated unloading is related to the peak power of the distributor and consumers on the transmission network in the previous year. Each distributor and consumer on the transmission network will once a year report to ISO on the location of the subfrequency relay as well as on the total expected cut of consumption achievable for each distribution network junction point.

Emergency Manual Unloading

8.2.9. In order to avoid risking the security of the electric power system and its parts with a threat of a total or partial breakdown followed by overload of the transmission network elements, voltage reduction and/or frequency below the acceptable limit, ISO may request an emergency manual disconnection of loads in certain parts of the system or the entire network junction point from the distribution network operator or TRANSCO. TRANSCO and the distribution network operators are responsible for the implementation of ISO orders.

8.3. Operational Restoration of the System after Total Breakdown

Black Start Capacities

8.3.1. Availability for Black Start of generation units (start without an outside supply) is a ancillary service implemented by ISO, in accordance with the Ancillary Services Contract.

8.3.2. In order to restore the integrity of the electric power system, it will be necessary to provide direct and redundant communication between ISO, TRANSCO, power generation companies and distribution network operators as well as between ISO and dispatching centers of the neighboring system operators.

Plan of the Operational Restoration of the Electric Power System

- 8.3.3. With support of TRANSCO and the users, ISO is responsible for preparation and updating of the plan of restoration of the electric power system, which will introduce a framework strategy for restoration of the electric power system after the entire electric power system of BiH or its parts have been disconnected from the UCTE system.
- 8.3.4. The objective of the plan of restoration of the electric power system is to provide guidelines for all parties included in the process of restoration of the electric power system so that the power supply can be restored as soon as possible. Given that availability for Black Start of power plants and transmission and user networks may vary from time to time, the plan of the operational restoration of the electric power system must be flexible.
- 8.3.5. The framework strategy for rehabilitation of the electric power system implemented by the users will be presented in the Power System Rehabilitation Plan, which will define the following steps:
- (a) Priority establishment of supply from the neighboring systems with the aim of preserving thermal parameters of thermal generators, priority consumption supply and faster rehabilitation of the system.
 - (b) Introduction of a certain number of isolated insular systems which rely on black start of power plants and a possibility of supply from a neighboring system.;
 - (c) Supply of the local load from all power plants,
 - (d) Synchronization, step by step, and interconnection of the isolated electric power systems,
 - (e) Final and complete restoration of the normal operating mode of the entire electric power system, including connections to the neighboring systems.

Updating the Power System Rehabilitation Plan

- 8.3.6. In cooperation with TRANSCO, ISO will update the Power System Rehabilitation Plan (PSRP). The PSRP will be updated and revised every third year.
- 8.3.7. In the intervention period between formal revisions, ISO may, in cooperation with TRANSCO, issue revised versions of the PSRP in order to coordinate it with changes of technical parameters which might affect changes of specific procedures of reconstruction (new power plants, high-voltage lines, priority consumers).

Implementation of Procedures of the Electric Power System Rehabilitation

- 8.9.8. TRANSCO and users must comply with the instructions issued by ISO during the electric power system rehabilitation process.
- 8.9.9. After the electric power system rehabilitation process is complete and back to normal, ISO will inform TRANSCO and the users on the normalization of the electric power system.

Resynchronization of the Islands

- 8.3.10. When parts of the system are no longer inter-synchronized but there is no total or partial breakdown, ISO will issue instructions to certain users to regulate generation or

consumption, as the case may be, to enable resynchronization. ISO will inform the users after (un)successful synchronization.

Procedures in Case of Multiple Incidents in the System

- 8.3.13. "Multiple incidents in the system", when they occur in the entire system, according to ISO, TRANSCO or the users, they lead to or may cause serious and/or broad consequences. When ISO establishes that a multiple incident has occurred, ISO will declare a pre-emergency state and take measures as appropriate in the new situation (Protection Plan from interruptions).

Training

- 8.3.14. ISO has to make sure that all its staff, which potentially may be included in the Power System Rehabilitation Plan, are familiarized with it and have adequate experience and training, not only in the implementation of the Power System Rehabilitation Plan but also to review and adapt it in order to make it efficient also in extraordinary circumstances, which may occur as a result of partial or complete breakdown of the electric power system.
- 8.3.15. TRANSCO and all the users mentioned in the procedures must provide adequate training for their employees who will be included in the Protection Plan and the Power System Rehabilitation Plan, as well as to make sure that those employees have adequate qualifications and experience.

9. Metering Code

9.1.1. Metering Codes refer to ISO, the Transmission company and Users which include:

- (a) Distributors;
- (b) Producers with production units directly connected to transmission system;
- (c) Consumers directly connected to transmission system.

9.1.2. This Metering Code sets forth rules, rights and obligations of the BiH market stakeholders for metering electric power and providing the data for the commercial management of the market. The metering and collection of readings are necessary for settlement and will be provided by ISO, TRANSCO and distributors in a non-discriminatory fashion, so that all market stakeholders have equal rights. The information is also necessary for the settlement of use of the transmission system, Ancillary Services and Imbalances. The functions of metering and collection of readings require confidential handling of information.

9.1.3. All system users must provide adequate accounting readings to enable the registration and collection of data on the flows of active and reactive power every fifteen (15) minutes and peak power. ISO will be responsible for the collection of metered data for provision of Ancillary Services as well as for the settlement and related payments.

9.2. General Requirements

9.2.1. The main principles adopted in this Metering Code are as follows:

- (a) Each network junction point of the market stakeholder must have a metering installation;
- (b) Every interstate line must have a metering installation;
- (c) TRANSCO will be responsible for metering installations of the transmission system users, as well as for the installation and maintenance of these installations according to technical recommendations.. TRANSCO may enable the provision of these services by any other registered metering service provider. Every system user may select a registered metering service provider;
- (d) Metering installations must be:
 - Safe;
 - Registered with ISO and approved for use by ISM (Institute for Standards, Metrology and Intellectual Property);
 - Capable of remote reading and electronic data transfer
- (e) Data on energy (kWh; kVAh) and power (kW);
- (f) Readings used for contractual settlement, system use, system imbalances and Ancillary Services are valid;
- (g) Historical data will be stored in the database of readings in ISO;
- (h) The party in charge of metering is responsible for the inspection of metering installations, including the instruments for main readings and instruments for auxiliary readings;
- (i) TRANSCO must prepare a registration process and metering register in order to facilitate the implementation of this Metering Code among market stakeholders, related to:
 - New metering installations;
 - Existing metering installations modifications;
 - Disconnection of metering installations;

- including provision of information on such issues as application process, timing, relevant parties, remuneration and metering installation details.
- (j) All metering installations must be in compliance with the standards set forth in this Metering Code, or those referring to them.

9.3. Metering Parameters

- 9.3.1. All transmission system users are required to have electronic metering capabilities with a possibility of registration and remote reading of the consumption of active and reactive power every fifteen (15) minutes and peak power, as well as of showing the data on a display. Metering also has to be verifiable, and must have information stored for the period of forty-five (45) days.

Transmission Network Connections

- 9.3.2. For each connection point of the user to the transmission network, and on each interconnection line, the following readings are required:
- (a) Received/Import kWh
 - (b) Delivery/Export kWh
 - (c) Received/Import kVArh
 - (d) Delivery/Export kVArh
- 9.3.3. During each fifteen (15) minute period, the following consumption data for each connection will be provided:
- (e) Received/Import kW
 - (f) Delivery/Export kW
 - (g) Received/Import kVAr
 - (h) Delivery/Export kVAr

Certain types of readings may be omitted as agreed with ISO.

9.4. Metering Accuracy

- 9.4.1. All active power meters must comply with the IEC standards 60687 and 61036.
- 9.4.2. All reactive power meters must comply with the IEC standard 61268.
- 9.4.3. In all cases, evidence of tests of voltage transformers (VT), current transformers (CT) and meters will be available for ISO inspection.
- 9.4.4. Metering installations accuracy classes will be as indicated in the table below:

Type	Connection accuracy class					
	400kV and 220kV		110kV		Other connections	
	Main	Aux.	Main	Aux.	Main	Aux.
CT	0.2S	0.5	0.2S	-	0.5	-
VT	0.2	0.5	0.2	-	0.5	-
Active Meters	0.2S	0.5	0.2S	-	0.5	-
Reactive Meters	2	2	2	-	2	-

9.4.5. Total metering accuracy will be as follows:

Current as the percentage of rated current	Power factor	Error margins for circuits on					
		400kV and 220kV		110kV		Other connections	
		Main	Aux.	Main		Main	Aux.
Active power							
20% to 120%	1	± 0.5%	± 1.1%	± 1.0%		± 1.6%	-
5% to 20%	1	± 0.5%	± 1.1%	± 1.0%		± 1.6%	-
1% to 5% ¹	1	± 0.7%	± 1.5%	± 1.4%		± 2.1%	-
20% to 120%	0.5 behind to 0.8 ahead	± 1.0%	± 2.3%	± 1.8%		± 2.5%	-
Reactive power							
10% to 120%	0	± 4.0%		± 4.0%		± 4.0%	
10% to 120%	0.866 behind to 0.866 ahead	± 5.0%		± 5.0%		± 5.0%	

Metering Resolution

9.4.6. The resolution of power registration during the registration period will be 0.5 times $k\%$ better than the registered power at the rated level. Factor k represents a meter accuracy class.

9.5. Defined Metering Points

Defined metering points will be in the following locations:

Transmission Company

9.5.1. The Transmission Company' responsibility for the metering installations will be limited to the following:

- (a) Metering installations on the interstate lines. A defined metering point will be stated in the contracts on use of transmission lines.

- (b) Installation, start-up, testing and maintenance of metering installations when it is responsible for metering.

Generation Companies

- 9.5.2. For the transmission of electric power from the generation company to the transmission system, a defined metering point will be a point of connection of the generation company to the transmission system, as stipulated in the Connection Contract.

Distribution Companies

- 9.5.3. For the transmission of electric power between the transmission system and distribution networks, a defined metering point for reception/delivery of electric power will be stipulated in the Connection Contract.

Consumers Directly Connected to the Transmission Network

- 9.5.4. For the transmission of electric power from the transmission system to the consumer directly connected to transmission network, a defined metering point for reception/delivery of electric power will be stipulated in the Connection Contract.

Actual Metering Point

- 9.5.5. A responsible entity must assure that the actual metering point will be located as close as possible to the defined metering point. In those locations where this is not possible or huge costs are necessary to meet this requirement, the actual metering point and the defined metering point may differ.
- 9.5.6. When the actual metering point and the defined metering point do not coincide, compensation will be provided, if necessary, for losses in the power transformer and/or transmission line in order to meet the overall requirements of accuracy in the defined metering point.
- 9.5.7. The compensation can be done locally using metering equipment or remotely with the help of software. In either case, compensation factors and their settlement must be approved by the installation owner, Transmission Company and Metering Provider (if different). The details must be submitted to ISO, which must agree and approve the agreed solution. The final compensation formula will be located in the metering register together with the contractual stipulations and parameters.

9.6. Metering Installation

- 9.6.1. The metering installation components consist of the following elements:
- (a) Metering transformers;
 - (b) Meter;
 - (c) Devices for data storing (recorder);
 - (d) Communication subsystems;
 - (e) Supervision of metering deficiencies;
 - (f) Clamped conductor.
- 9.6.2. Although the above details on various functional elements that constitute individual metering installations, they can also be provided from the same part of equipment.

Metering Transformers

- 9.6.3. Current (CT) and voltage (VT) metering transformers must comply with the existing IEC standards.
- 9.6.4. The Transmission Company must have an attestation for metering transformers for entering into the Metering Register.

Meters

- 9.6.5. The amount of electric power will be metered by the main and auxiliary meters.
- 9.6.6. The meters of active and reactive power must be three-system meters and meet the defined accuracy classes.
- 5.1. All meters will be marked with a specific name and this information together with technical details and specifications will be available to the Transmission Company for the inclusion in the Metering Register.

Data Storage

- 9.6.8. Capacity of the device for storage of fifteen-minute data must be capable of storing all the data metered in the period of at least forty five (45) days.
- 9.6.9. In cooperation with TRANSCO ISO will define and choose a format, protocol and timeframe for the remote data reading, in compliance with the UCTE standards and Market Rules requirements.
- 9.6.10. ISO will be able to repeat the remote data readings throughout the period of data storage at any time.
- 9.6.11. Metering installations will be equipped with protection against losing the stored data.
- 9.6.12. The devices for storing the readings will provide the following:
 - (a) Incomplete values of power and consumption, in which the interruption occurred and/or supply was restored for the data storage device, and the zero value of power and consumption caused by a power supply problem of the data storage devices, will be marked so that the system for collection of readings can identify them;
 - (b) Until supply is restored, clock, calendar and all the data will be supported for the period of forty five (45) days without an outside supply source;
 - (c) Every “reading” of the data will not erase or modify the readings saved.

Metering Installations Protection

- 9.6.13. After the start-up, all metering installation equipment will be sealed in accordance with an adequate procedure. A seal will be placed in a manner that the interior of the metering instrument cannot be accessed without breaking the seal.
- 9.6.14. Users, Transmission Company, and ISO must have an unlimited access to the metering installations for inspection, data verification and revision of installations.

9.7. Data Access

- 9.7.1. Readings stored in the metering installation will be protected from unauthorized local and remote electronic access by appropriate codes.
- 9.7.2. The Transmission Company must allow users “read” access to the data relevant to the users by assigning appropriate codes, and “read” approach to ISO by assigning

appropriate codes. The stakeholders' codes will be kept in the metering register and will be protected appropriately.

Documents

- 9.7.3. The defined metering point and all other related components, settings and parameters must be clearly stated and registered in the metering register. All modifications of the components and settings must be coordinated with the Transmission Company.
- 9.7.4. Design, technical specifications and a diagram of metering installation connections must be documented. They must contain technical data and settings of the parameters of metering transformers and meters.
- 9.7.5. The documents must be provided by a given Metering Provider and will be kept by a person in charge of metering in the defined metering point. They will also be left with the Transmission Company to be entered into the Metering Register.

9.8. Testing and Calibration of Metering Installations

- 9.8.1. ISO and TRANSCO will approve the programs for starting up the equipment and the tests, as well as review the results.
- 9.8.2. ISO must be informed about the modification of parameters of the existing metering installations by authorized personnel, before the modifications have been made.
- 9.8.3. Metering installations will be calibrated and tested in compliance with the existing standards and regulations.

Meters

- 9.8.4. All main and auxiliary meters must have:
 - (a) Initial calibration – All meters will be calibrated before they enter commercial use, in compliance with specifications and technical performances requirements of the authorized institution and this Metering Code.
 - (b) Periodical tests – All meters will be tested regularly, calibrated periodically and replaced if necessary.
- 9.8.5. The testing and calibration is carried out in compliance with the appropriate standards and applying regulations on metering. The dates and results of all tests must be submitted to the Transmission Company for registration in the metering register. Special tests may be requested if necessary.

Metering Transformers

- 9.8.6. All metering transformers will have the following:
 - (a) Initial calibration – New metering transformers will be calibrated before they enter commercial use at any given location, in compliance with specifications and technical performance requirements of authorized institution and this Metering Code.

- (b) Periodical tests – Periodical tests are required for metering transformers in compliance with the existing standards.

Data Storage Devices

9.8.7. All data storage devices will have the following:

- (c) Initial calibration – New data storage devices will be calibrated before they enter commercial use at any given location, in compliance with the specifications and technical performance requirements of authorized institution.
- (d) Periodical tests – Periodical tests are not required for data storage devices unless there is an obvious deficiency.

9.9. Meter Errors

9.9.1. In case that ISO detects an error or an error is suspected, or if this was reported to ISO by user, ISO will initiate the following procedure:

- (a) It will inform the party in charge of metering and Metering Provider within 24 hours;
- (b) Order local collection of readings, when necessary;
- (c) Order the party in charge of metering to inspect and remove the problem.

9.9.2. If the main meter in the installation with an auxiliary meter shows a deviation 1.5% larger than in the auxiliary meter, both meters must be tested. If it turns out that the main meter is deficient, the data metered by the auxiliary meter will be treated as accurate.

9.9.3. If the test of the metering installation, inspection or revision, shows an error bigger than prescribed and if ISO is not aware of the time when the error occurred, half way through between the time of the last test or inspection, which showed that the metering installation met the accuracy requirements and the time when the error was discovered will be considered the time when the error occurred.

9.10. Metering Register

9.10.1. The purpose of the Metering Register is the registration of network junction points and metering points.

9.10.2. The Metering Register will be a responsibility of the Transmission Company, which will be in charge of updating, maintenance and administration, as well as be responsible for its safety and confidentiality. Before any modification that will affect the readings, the Transmission Company must inform ISO.

9.10.3. The Transmission Company is obligated to define all necessary data for the Metering Register, which has to contain the following minimum:

- (a) Details on network junction points and the metering point (location, party in charge, identification codes and other relevant data);
- (b) Metering installation equipment (manufacturer, type, model, serial number, manufacturing date and metering installation class; all data relevant for physical and technical specifications, standards, rated and maximum power, all information related to testing and start-up, which include test results and certificates and dates of calibrations and other relevant data.);
- (c) Information on data communication (telephone numbers for data collection, information on other types of communication for data collection, types, serial

numbers, technical specification of communication equipment and other relevant data).

9.11. Database of Readings

- 9.11.1. ISO, TRANSCO and Producers will by a special document define the organization and the manner of collection of remote metering data. The Database of Readings and its updating, maintenance and administration will fall under an exclusive responsibility of ISO, which will be responsible for safety, confidentiality and storage of data.
- 9.11.2. Readings consist of all read, calculated and collected data used for settlement, network
- 9.11.3. ISO will confirm, process and secure the data and store them in the database.
- 9.11.4. If the remote reading of data is prevented, ISO and TRANSCO will organize the collection of relevant data by local reading. If this is not possible either, ISO will use other methods (e.g. SCADA) for the assessment of necessary data.
- 9.11.5. The readings include:
 - (a) Original, time dependent values of active and reactive power and energy, as collected from the metering installations;
 - (b) Values calculated based on the original data, as processed by ISO;
 - (c) Assessed and modified or replaced data in case of incorrect or lost data;
 - (d) Data and values that will be used for the calculation.
- 9.11.6. Readings must be collected, processed, administrated and stored in a safe and confidential manner.
- 9.11.7. Metering system will be set to the Central European Time (CET)
- 9.11.8. All data will be stored in the Database of Readings for at least one (1) year and the archived data in accordance with the Law on Archive of BiH..
- 9.11.9. ISO is responsible for inspection of validity of data and replacement of data in case of errors or missing data..

9.12. System User Responsibilities

- 9.12.1. Every system user which owns a metering installation is responsible for submitting to the Transmission Company, for each of its metering points, the above data, correctly updated and to immediately inform the Transmission Company on the following situations:
 - (a) When a new metering installation was installed;
 - (b) When any modification was made to the data from the metering register, such as the modification of the metering installation characteristics.

9.13. Data Replacement

- 9.13.1. If differences occur in the readings or if it becomes necessary to make a replacement, ISO is responsible for the replacement of readings and must develop a data replacement process and appropriate guidelines in consultation with other market stakeholders.

- 9.13.2. In a total absence of readings or error in the metering installation, the data must be replaced using the best possible assessments. In this case, the historical data should be used from SCADA as well as other available sources.
- 9.13.3. If there is an inconsistency between the data from the metering installation and the Database of Readings, and there is no other source to verify the accuracy of the data, the data from the metering installations will be taken as primary valid data for the power metering point.

9.14. Data Access and Safety

- 9.14.1. The Metering Register is owned by the Transmission Company. To protect the safety of the Metering Register, only the Transmission Company will have a direct access to it. The Transmission Company will provide the data of the Metering Register in response to a written request from any of the below parties. This information will be provided for the purpose of confirmations, testing, disputes, calibrations or some other reason that the Transmission Company finds legitimate. In any case, the information will be provided electronically as soon as possible but no later than one week. The parties which have the right to request the information are:
- (a) Party in charge of metering the relevant metering installation;
 - (b) Distribution companies for all metering installations at the network junction points of their network.
- 9.14.2. The Transmission Company will enable access to the metering register to ISO.
- 9.14.3. ISO will enable all users to access the data that is relevant for them from the Metering Register.

10. Miscellaneous

10.1.1. This part refers to ISO, the Transmission company and Users which include:

- (a) Producers;
- (b) Distributors;
- (c) Directly connected consumers.

10.2. Testing and Supervision

Supervision Procedure

10.2.1. ISO will monitor:

- Work of the generation units according to PPPD and other related agreements;
- Compliance of the Transmission Company and users with the Terms for Connection;
- Whether the Transmission Company discharges all the obligations as defined in the Network Rules;
- Whether users provide Ancillary Services in accordance with the contracts signed.

Non-Compliance

10.2.2. In case that ISO finds out through monitoring that a generation unit permanently fails to meet the requirements defined by PPPD, or the Transmission Company or the user fails to comply with the provisions of the Terms for Connection or the Ancillary Services Contract, ISO will inform the Transmission Company or the relevant user presenting the details of the failure and the supervision carried out by ISO.

10.2.3. The Transmission Company or a relevant user will, as soon as possible, explain to ISO the reasons of its failure and non-compliance and will:

- (a) In case of the power generation company, give details on the action it recommends for the generation unit to be able to comply with the parameters;
- (b) In case of the Transmission Company or the user, give details on actions it recommends in order to comply with the provisions of the Terms for Connection or, as the case may be, provision of certain Ancillary Services.

10.2.4. ISO and the Transmission Company or the user will make an effort to reach an agreement on the parameters to be used and the deadlines for the implementation of the agreed parameters.

10.2.5. In case the agreement cannot not be reached, ISO is entitled to request the performance of the following tests:

- Testing of System Services (reactive power, primary and secondary frequency regulation, tertiary reserve capabilities, black-start);
- Any tests relating to the contracts on connection;

- Tests relating to the metering, protection and communication equipment of the Transmission Company and the user.

- 10.2.6. ISO may request from the user or the Transmission Company, at any time, to perform a certain test. The testing program and deadlines will be arranged for each individual case depending on the type of testing. An ISO representative is entitled to attend every test.
- 10.2.7. A system user whose equipment was tested must submit to ISO a protocol on the tests performed as well as evidence of accuracy and reliability of the equipment used for testing.
- 10.2.8. If a generation unit fails the test, the user must submit a written report to ISO stating the reasons for failing the test. The report must be submitted no later than five (5) calendar days after the test.

10.3. Operational Cooperation and Provision of Information on Incidents

Request for Reporting on the Operations and Incidents

- 10.3.1. In case of works or incidents on the transmission system that is under the control of ISO, which will or could have consequences on the activities of other users, ISO will inform on the matter all the users that will, or could be, in the founded opinion of ISO, affected by those works or incidents.
- 10.3.2. In case of planned works or incidents on the user system, which will or could have consequences on the activities of the electric power system or other users, the user will inform ISO and ISO will inform those that will be affected by those works or incidents.
- 10.3.3. Reporting and registration will be carried out using the agreed communication methods as specified in the Terms for Connection and identified in a relevant Connection Contract. When there is not enough time for reporting in any written form, the reporting will be done verbally with a written proof necessary to confirm the verbal agreement.

Reporting on Major Unsolicited Incidents

- 10.3.4. Major unplanned incidents will include the incidents occurring as a consequence of the operations, which result, or may result, in the following:
- (a) Disconnection of the parts of the system;
 - (b) Voltage outside the normal operational limits;
 - (c) Frequency of the electric power system outside the normal operational limits;
 - (d) Instability of the electric power system;
 - (e) Overload of equipment, generation units in power plants or transmission system elements;
 - (f) Danger for the operational staff of the user, Transmission Company or ISO.
- 10.3.5. The ISO, Transmission Company and users will appoint their persons in charge in case of unplanned incidents.
- 10.3.6. After the unplanned incidents, mutual written reporting is mandatory. The report will contain a confirmation of the verbal report. If an author of the report is not always in a position to inform on the cause of the incident with an absolute certainty, he will do his best to precisely determine and inform on the cause of the incident. When suspecting that

an unsolicited incident could occur again, the author of the report will note that as well. The recipient may request a clarification of the report.

10.3.7. Written reports must be submitted no later than two (2) working days after the verbal report.

10.3.8. Contents of the report on major unplanned incidents:

- (a) Time and date of a major unexpected incident;
- (b) Cause;
- (c) Location and directly connected equipment and/or instruments;
- (d) Description of a major unplanned incident;
- (e) Disconnected consumption (in MW) and/or generation (in MW) and the duration of interruption (if applicable);
- (f) Generation unit – frequency response (correction of MW achieved after a major unexpected incident) (if applicable);
- (g) Generation unit – MVAR performances (change in generation after a major unplanned incident) (if applicable);
- (h) Every reduction of unavailability of the generation unit/capabilities of the system which still exists, which results from a major unplanned incident (if applicable); and
- (i) Estimate of the time and date of reconnection (as appropriate).

10.3.9. Whenever the Transmission Company or the user submits to ISO a written report that relates to an incident, and if, in the opinion of ISO, there is a user that can suffer adverse affects from it, ISO will forward to him the relevant information on the incident.

System's Warning

10.3.10. ISO will issue appropriate warnings to the Transmission Company and certain users if it finds it necessary, with an intention to:

- (a) Warn users to a possibility of insufficient generation of power plants, problems in the system and/or possibility of a consumption cut;
- (b) Inform on the duration of warning;
- (c) Indicate the expected consequences for users;
- (d) Alert certain users to be able to respond properly to the orders and instructions from ISO.

10.3.11. During the system warning, every user, when it has received the system warning, will take necessary steps to warn its operational staff and maintain its equipment and/or instrument in a state best to overcome the expected disruption.

10.3.12. During the system warning, ISO may issue emergency instructions.

Joint Investigations

10.3.13. When major unplanned incidents (or a series of incidents) were reported and a report (reports) was submitted, ISO, Transmission Company or the user that received or sent a written report may request a joint investigation of the major unplanned incident.

10.3.14. In case of a series of major unplanned incidents (e.g. when such an incident causes or deteriorates other major unplanned incidents), the party requesting a joint investigation or

a recipient of such a request may request that the joint investigation include that other unplanned incident (incidents).

10.3.15. A joint investigation will be conducted only if ISO, Transmission Company and concerned user or users agree on the matter. Forms and rules as well as the procedures for all the issues (including, if appropriate, the provision on costs and the party that can revoke the investigation once it has started) related to the joint investigation will be agreed during the investigation.

10.3.16. Recommendations related to the recommended joint investigation will be issued in a written form.

10.4. Equipment Tests

10.4.1. The equipment test is performed at the location of the user and the Transmission Company and will be mandatory performed in case of a start-up or in case of reconnection of the equipment and/or instrument.

Announcement

10.4.2. To perform an equipment test, the user, Transmission Company or ISO (proponent) must announce it others (recipients). The announcement must be issued prior to the test taking into account the nature of the test and the circumstances of the test. This will give the recipients time to assess the effect of the equipment test on its system.

10.4.3. The announcement of the equipment test must include the following information:

- (a) Recommended date and time of the test;
- (b) Name of the individual and organization recommending the test;
- (c) Recommended testing program; and
- (d) Other details that the proponent finds necessary for the recipient's assessment of the effect of the test on certain equipment and/or instruments.

Response to the Announcement of the Equipment Test

10.4.4. When ISO receives an announcement of the equipment test from the Transmission Company or the user, ISO will contact the Transmission Company and/or other users that it thinks might be affected by the recommended test, in order to obtain their opinion, after which it will approve or reject the recommended test.

10.4.5. The response of the recipient, after the announcement of the equipment test, must be one of the following:

- (a) To accept the recommendation for a test;
- (b) To conditionally accept the test, depending on minor modifications and the date and time; or
- (c) Not to agree with the integral equipment test but to recommend an alternative date and time of the test for the test to be acceptable.

Final Approval of the Equipment Test

10.4.6. The date and time of the equipment test will be arranged between ISO and Transmission Company and/or user given all the constraints in the work of the equipment and/or instruments.

- 10.4.7. The equipment test may be subsequently changed following the discussion and agreement between ISO and the Transmission Company and/or user.

Performance of the Equipment Test

- 10.4.8. The equipment test may be performed only after the agreement on the test is reached and it must be performed in accordance with the agreed testing program.
- 10.4.9. When the testing program elements are changed during the test, there has to be a discussion with the relevant parties to see if the test should be continued.

10.5. Safety Coordination

- 10.5.1. In accordance with the Connection Contract, each user and the Transmission Company must have safety rules and safety instructions for each connection location.
- 10.5.2. If any party wants to modify its safety instructions for a particular location that relate to insulation or grounding, it must inform the other party on the matter. If the modifications are such as to make the provisions stricter, the other party should also inform on them. If the modifications are such as to make the provisions less strict, the other party must approve new provisions and procedures.
- 10.5.3. The Transmission Company and all users must have in their organizational structures persons in charge of coordination and implementation of safety measures.
- 10.5.4. The Transmission Company and the users must keep safety diaries that will contain all the activities relating to safety coordination chronologically. The safety diaries must be kept for at least one year.

10.6. Numbering and Nomenclature of HV Instruments at Interface Locations

- 10.6.1. All the equipment and/or instruments of the Transmission Company or the users at the network junction points will have numbering and/or nomenclature that will not create confusion and lead to a mix-up of the equipment and/or instruments that belong to the Transmission Company and/or other users, as the case may be. Records on the number and/or nomenclature will be kept by the Transmission Company.
- 10.6.2. The Transmission Company and the users will secure, numbering and/or nomenclature of all the equipment and/or instruments at the network junction points prior to their commissioning test.

11. General Terms and Conditions

11.1. Commission for Amendments to the Grid Code

- 11.1.1. ISO will in accordance with the Law establish a Technical Committee for the Amendments to the Grid Code. ISO will consult the Committee in order to enable stakeholders to give comments on proposed amendments. Committee meetings will be public.
- 11.1.2. Work of the Technical Committee will be performed in accordance with the Rulebook of the Committee.
- 11.1.3. ISO will form a Work-group for the amendments to the Grid Code i ensure its continuous work. The group will consist of ISO and TRANSCO employees.
- 11.1.4. The Work-group will:
 - (a) Monitor and review the Grid Code and its implementation;
 - (b) Take into consideration all proposals related to the amendments to the Grid Code which the Regulator (SERC) or any other user may submit to ISO;
 - (c) Provide clear proposals for the amendments to the Grid Code;
 - (d) Issue guidelines for the Grid Code and its implementation and interpretation based on a legitimate request from any user.
- 11.1.5. Work-group will submit its attitude towards all proposals for amendment to the Grid Code.
- 11.1.6. All proposed amendments to the Grid Code must be reviewed by the Technical Committee. ISO's final proposal for amendments to the Grid Code will be submitted with notes from Technical committee and clarifications enclosed.

11.2. Interpretation of the Grid Code

- 11.2.1. In case that any user requests an additional interpretation of the intention and implementation of any section (sections) of the Grid Code, it may request such an interpretation from ISO. ISO will provide the user with the interpretation of a given section (sections) and make publicly available both the request and the interpretation.
- 11.2.2. In case that the user finds the interpretation that it had received from ISO incomplete, it may seek additional explanation from ISO.

11.3. Unlawfulness and Partial Invalidity

- 11.3.1. If any provision of the Grid Code becomes or is declared unlawful or partially invalid for any legal or statutory reason, it will not affect validity of other remaining provisions of the Grid Code.

11.4. Provisions on Dispute

- 11.4.1. In case of a dispute arising between the system users related to the rules and procedures defined in the Grid Code, the parties will make an effort to, in good will, resolve the dispute related to the issues covered by this Code.
- 11.4.2. In case that the parties cannot resolve the dispute, it will be resolved according to Law, legal acts and rules.

11.5. Procedure of Making Exceptions

- 11.5.1. If a user or the Transmission Company is not or will not be able to comply with the provisions from the Grid Code, it will inform ISO on the matter. ISO, Transmission Company and the user will act in the following manner in case of such non-compliance.
- 11.5.2. When the disagreement relates to:
- (a) The equipment and/or instrument which is connected to the transmission system and is caused exclusively or mainly by the modification of the Grid Code; or
 - (b) The equipment and/or instrument which is connected, approved for connection or the connection for which the transmission system is requested,
 - (c) The equipment and/or instrument which is a part or is planned to be a part, of the transmission system,
- and the user believes it would be unreasonable (including the price and technical considerations) to request a correction of such a disagreement or to allow for a certain period of time for its correction, it will file a request to SERC to immediately make an exception from such a provision in compliance with the requirements of the appropriate section, while ISO will be given a copy of this request.
- 11.5.3. The request for making an exception from the provision of the Grid Code will contain:
- (a) Number of the issue and date of the provision of the Grid Code which is the subject of disagreement or for which the disagreement is related;
 - (b) Identification of the equipment and/or instrument for which the exception is being made and, if relevant, nature and duration of the exception;
 - (c) Identification of the provision which the user cannot, or will not be able to, comply with;
 - (d) Reason for non-compliance; and
 - (e) Date of when it will be able to comply.
- 11.5.4. Having received a request for making an exception, SERC will immediately take into consideration such a request.
- 11.5.5. Making an exception from any provision of the Grid Code will be ensured by ISO and it will contain:
- (a) Number of the issue and date of the provision of the Grid Code that the request for making an exception relates to;
 - (b) Identification of the provision that the exception relates to;

- (c) Identification of the equipment and/or instrument that the exception relates to and, if necessary, nature and extent of the exception, including the provisions of the modified approvals;
- (d) Reason for disapprovals for which the exception is requested;
- (e) Date by which the exception ceases if the agreement is reached or by which the making of exception expires.

11.5.6. Within the limits of the allowed exception making in accordance with this section, the user will be free from the obligation to comply with the applicable provision of the Grid Code and will not be responsible for its inability to comply, but will have to comply with all the modified provisions as defined above in the making of exceptions.

11.5.7. ISO will:

- (a) Keep the register of all the exceptions that were made, stating the name of the person at whose request the exception was made, relevant provision of the Grid Code and the period of exception; and
- (b) At the request of any user, provide a copy of this register of exceptions to that user.

11.5.8. In case of major changes of circumstances, a review of the existing exceptions as well as all the exceptions under consideration may be initiated by SERC at the request of SERC, ISO or the user.

11.6. Unforeseen Circumstances

11.6.1. In case of circumstances that have not been foreseen by the provisions of the Grid Code, ISO will, to the extent possible under such circumstances, consult all the users concerned in order to reach an agreement on taking adequate measures. If ISO and these users cannot reach an agreement on the measures to be taken, ISO will make a decision on how to proceed. Every user will comply with all the instructions issued by ISO. ISO will promptly inform the Technical Committee on all unforeseen circumstances and relevant decisions.

11.7. Final and Transitional Provisions

11.7.1. This Grid Code enters into full force on the day of acceptance of the resolution on the approval of the Code by SERC. It will start applying eight (8) days after the publication of SERC's resolution in the Official Gazette of BiH.

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